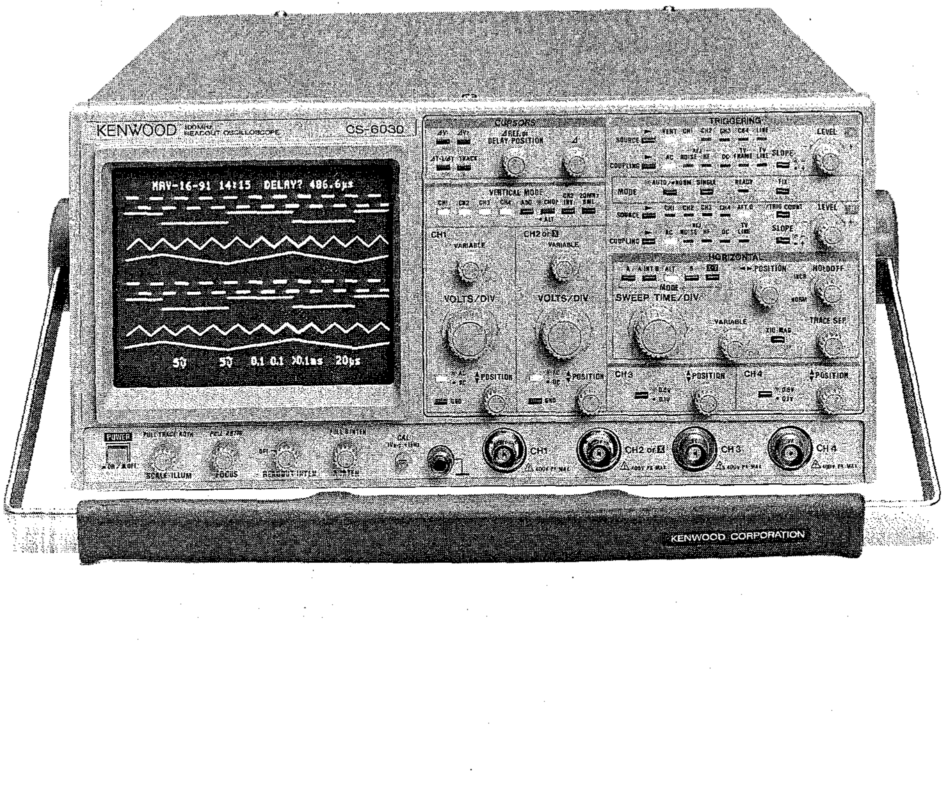
100MHz READOUT OSCILLOSCOPE

CS-6030

SERVICE MANUAL

KENWOOD CORPORATION



WARNING

The following instructions are for use by qualified personnel only. To avoid electric shock, do not perform any servicing other than contained in the operating instructions unless you are qualified to do so.

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SPECIFICATIONS

CRT		150 mm rectangular with internal graticule
Acceleration Voltage		17 kV
Display Area		8×10 div (1 div=10 mm)
VERTICAL AXIS (CH1 and CH2)		
Sensitivity		5 mV/div to 5 V/div ±2% (10 °C to 35 °C) 1 mV/div to 2 V/div ±4% (10 °C to 35 °C)
Attenuator		12 steps, 1 mV/div to 5 V/div in 1-2-5 sequence Vernier control for fully adjustable sensitivity between steps
Input Impedance		1 MΩ ±1%, 20 pF ±3 pF
Frequency Response		
	5 mV/div to 5 V/div	DC; DC to 100 MHz, within −3 dB AC; 5 Hz to 100 MHz, within −3 dB
	1 mV/div, 2 mV/div	DC; DC to 20 MHz, within −3 dB AC; 5 Hz to 20 MHz, within −3 dB
Rise Time		3.5 ns or less (5 mV/div to 5 V/div) 17.5 ns or less (1 mV/div, 2 mV/div)
Signal Delay Time		More than 10 ns on the CRT screen
Crosstalk		−40 dB or less (at 1 kHz)
Operating Modes	CH1	CH1 single trace display, and dual to quad trace display in combination with other channel (s)
	CH2	CH2 single trace display, and dual to quad trace display in combination with other channel (s)
	CH3	CH3 single trace display, and dual to quad trace display in combination with other channel (s)
	CH4	CH4 single trace display, and dual to quad trace display in combination with other channel (s)
	ADD	CH1+(±CH2) added display, and dual to quad trace display in combination with other channel (s)
	ALT	Dual to quad trace alternating
	CHOP	Dual to quad trace chopped
Channel Polarity		Normal or inverted, channel 2 only inverted
Bandwidth Limiting		Approx. 20 MHz
Chop Frequency		Approx. 500 kHz
Delay Time Difference		CH1 to CH2 ; 0.5 ns or less CH1, CH2 to CH3, CH4 ; 1 ns or less
Non-distorted Maximum Amplitude		More than 8 div (DC to 100 MHz)
⚠ Maximum Input Voltage		800 Vp-p or 400 V (DC+AC peak)
VERTICAL AXIS (CH3 and CH4)		
Sensitivity		0.1 V/div, 0.5 V/div, ±2% (10 °C to 35 °C)
Input Impedance		1 MΩ ±1%, 20 pF ±3 pF
Coupling Method		DC coupling
Frequency Response		DC to 100 MHz, within −3 dB
Rise Time		3.5 ns or less (at 150 MHz)
⚠ Maximum Input Voltage		800 Vp-p or 400 V (DC+AC peak)
HORIZONTAL AXIS (Input thru CH2)		
Operating Modes		With HORIZ. MODE switch, X-Y operation is selectable CH1 to CH4 and ADD ; Y axis CH2 ; X axis
Sensitivity		Same as vertical axis (CH2)
Input Impedance		Same as vertical axis (CH2)
Frequency Response	DC	DC to 2 MHz, within −3 dB
	AC	5 Hz to 2 MHz, within −3 dB
X-Y Phase Difference		3° or less at 100 kHz
⚠ Maximum Input Voltage		Same as vertical axis (CH2)

SPECIFICATIONS

SWEEP		
Type	A	A sweep
	A INT B	B sweep waveform is displayed as an intensified portion of the A sweep.
	ALT	A sweep (intensified for duration of B sweep) and B sweep (delayed sweep) alternating
	B	B sweep
	X-Y	X-Y oscilloscope
Sweep Time	A	20 ns/div to 0.5 s/div, ±2% (10 °C to 35 °C), in 23 ranges, in 1-2-5 sequence Vernier control provides fully adjustable sweep time all ranges.
	B	20 ns/div to 5 ms/div, ±2% (10 °C to 35 °C), in 20 ranges, in 1-2-5 sequence
Sweep Magnification		×10 (ten times) ±5% (A and B)
Linearity		20 ns/div to 0.5 s/div : ±3% (±5%, at ×10 MAG)
Holdoff		Continuously variable for A sweep from NORM to more than five times
Trace Separation		B sweep can be separated from A sweep up to 4 divisions downward, continuously adjustable.
Delay Method		Continuous delay, Trigger delay and Trigger count
Delay Time		Continuous delay, Trigger delay ; 0.2 to 10 times of A SWEEP TIME/DIV set value (5,000 count fullscale)
Trigger Count		1 to 2,000 count, Max. usable frequency: 10 MHz
Delay Accuracy		±(2% of set value +1% of fullscale)+(0 to 100 ns)
Delay Jitter		1/20,000
TRIGGERING		
A Trigger Modes		AUTO, NORM, SINGLE, FIX
A Trigger Source	V. MODE	Triggered by input signal selected with VERTICAL MODE selector
	CH1	Triggered by CH1 vertical axis input signal
	CH2	Triggered by CH2 vertical axis input signal
	CH3	Triggered by CH3 vertical axis input signal
	CH4	Triggered by CH4 vertical axis input signal
	LINE	Triggered by line frequency
A Trigger Coupling		AC, NOISEREJ, HFREJ, DC, TV FRAME, (In TV COUNT mode, enables switching getween FLD1/FLD2 and 525/625 lines.), TV LINE
A Trigger Level		±90 ° adjustable
A Trigger Polarity		+/−
B Trigger Modes		Sterts After Delay, B Triggerable After Delay and TRIG COUNT
B Trigger Source	CH1	Triggered by CH1 vertical axis input signal
	CH2	Triggered by CH2 vertical axis input signal
	CH3	Triggered by CH3 vertical axis input signal
	CH4	Triggered by CH4 vertical axis input signal
B Trigger Coupling		AC, NOISEREJ, HFREJ, DC, TV LINE
B Trigger Level		±90 ° adjustable
B Trigger Polarity		+/−

SPECIFICATIONS

Trigger Sensitivity	COUPLING	FREQUENCY RANGE	MINIMUM SYNC AMPLITUDE
	DC	DC to 50 MHz/DC to 100 MHz	1 div/1.5 div
	AC	20 Hz to 50 MHz/20 Hz to 100 MHz	1 div/1.5 div
	NOISEREJ	Two times of minimum sync amplitude.	
	HFREJ	Increased minimum sync amplitude for above 30 kHz.	
	TV FRAME	1 div (140 IRE)	
	TV LINE	1 div (140 IRE)	
	AUTO: Same as above specification for above 50 Hz	FIX: Same as above specification for above 40 Hz.	
Jitter		0.5 ns or less at 100 MHz at 2 ns/div sweep rate (×10 MAG on)	
INTENSITY MODULATION			
Sensitivity		+5 V, Negative voltage increases brightness, positive voltage decreases brightness	
Input Impedance		Approx. 10 kΩ	
Usable Frequency Range		DC to 10 MHz	
⚠ Maximum Input Voltage		50 V (DC+AC peak)	
VERTICAL AXIS OUTPUT (CH1 only)			
Output voltage		Approx. 50 mVp-p/div (into 50 Ω load)	
Output Impedance		Approx. 50 Ω	
Frequency Response		100 Hz to 100 MHz, within −3 dB (at into 50 Ω)	
TRACE ROTATION		Electrical, adjustable from front panel	
CALIBRATION VOLTAGE		1 V p-p ±1%, Positive square wave, 1 kHz ±3%	
READOUT			
Calendar		Year/Month/Day/O'clock/Minute Clock accuracy; ±2 min./month Battery life: About 30,000 hours (at room temperature)	
Set Value		CH1−CH4 scale factor (with probe detection), GND, AC/DC, V-UNCAL, ADD, INVERT, BW, A and B sweep scale factor (magnification conversion), SWEEP VERIABLE UNCAL, X-Y (CH2-X), DELAY TIME, TRIG COUNT, TV COUNT	
Cursor Mode	ΔV1	Voltage difference between ΔREF and Δcursors on a CH1 scale factor basis	
	ΔV2	Voltage difference between ΔREF and Δcursors on a CH2 scale factor basis	
	ΔT	Time difference between ΔREF and Δcursors on the basis of sweep scale factor	
	1/ΔT	Frequency between ΔREF and Δcursors on the basis of sweep scale factor	
		RATIO: Voltage ratio and time ratio between ΔREF and Δcursors, supposing 5-division on the CRT as 100%	
		PHASE: Phase difference between ΔREF and Δcursors, supposing 5-division on the CRT as 360°	
Cursor Measurement	Resolution	10 bits	
	Measurement accuracy	±3%	
	Measurement range	Vertical direction: ±3.6 div or more from the CRT center Horizontal direction: ±4.6 div or more from the CRT center	

SPECIFICATIONS

PROGRAM MODE			
Programming capacity			20 steps × 5 blocks
Programmable parameters	CURSORS	CURSOR MODE	ΔV1, ΔV2, ΔT, 1/ΔT, TRACKING
		CURSOR	ΔREF, Δ
	VERTICAL	VERTICAL MODE	CH1, CH2, CH3, ADD, CHOP, ALT, CH2 INV, 20 MHz BWL
		ALT	CH1, CH2, CH3, CH4
		ACC, DC, GND	CH1, CH2
	HORIZONTAL	HORIZONTAL MODE	A, A INT B, ALT, B, X-Y
		SWEEP TIME	A, B
	TRIGGERING	A SOURCE	VERT, CH1, CH2, CH3, CH4, LINE
		A COUPLE	AC, NOISE$_{\text{REJ}}$, HF$_{\text{REJ}}$, DC, TV FRAME (TV COUNT FLD1/FLD2), TV LINE
		A SLOPE	+/−
		B SLOPE	CH1, CH2, CH3, CH4, TRIG DELAY, AFT DELAY, TRIG COUNT
		B COUPLE	AC, NOISE$_{\text{REJ}}$, HF$_{\text{REJ}}$, DC, TV LINE
		B SLOPE	+/−
	SWEEP MODE		AUTO, NORM, SINGLE, FIX
Program Step Input	Input voltage		"H" (above 3.2 V), "L" (0.5 V or less), setting to "L" advances count one step
	Input impedance		Approx. 10 kΩ
	Maximum input voltage		50 V (DC + AC peak)
POWER REQUIREMENT			
Line Voltage			100 V/120 V/220 V/240 V AC ±10%
Line Frequency			50/60 Hz
Power Consumption			73 W
DIMENSIONS (W × H × D)			310 (332) × 150 (163) × 400 (448) mm ( ) dimensions include protrusion from basic outline dimensions
WEIGHT			Approx. 9 kg
ENVIRONMENTAL			
Within Specifications			10°C to 35°C, 85% max. relative humidity
Full Operation			0°C to 40°C, 85% max. relative humidity
ACCESSORIES SUPPLIED			
Probe			PC-31 (READOUT compatible probe) × 2 Attenuation..............1/10 Input impedance........10 MΩ ±1%, 14 pF ±10%
Replacement Fuse			1.2 A × 2, 0.8 A × 2
Instruction Manual			1

* Circuit and rating are subject to change without notice due to developments in technology.

SAFETY

SAFETY

Before connecting the instrument to a power source, carefully read the following information, then verify that the proper power cord is used and the proper line fuse is installed for power source. The specified voltage is shown at the fuse holder of the AC inlet. If the power cord is not applied for specified voltage, there is always a certain amount of danger from electric shock.

Line voltage

This instrument operates using ac-power input voltages that 100/120/220/240 V at frequencies from 50 Hz to 60 Hz.

Power cord

The ground wire of the 3-wire ac power plug places the chassis and housing of the oscilloscope at earth ground. Do not attempt to defeat the ground wire connection or float the oscilloscope; to do so may pose a great safety hazard. The appropriate power cord is supplied by an option that is specified when the instrument is ordered.
The optional power cords are shown as follows in Fig. 1.

Line fuse

The fuse holder is located on the rear panel and contains the line fuse. Verify that the proper fuse is installed by replacing the line fuse.

Voltage conversion

This oscilloscope may be operated from either a 100 V to 240 V, 50/60 Hz power source. Use the following procedure to change from 100 to 240 volt operation or vice versa.

1. Remove the fuse holder.
2. Replace fuse F 1 with a fuse of appropriate value, 1.2 amp for 100 VAC to 120 VAC operation, 0.8 amp for 220 VAC to 240 VAC operation.
3. Reinsert it for appropriate voltage range.
4. When performing the reinsertion of fuse holder for the voltage conversion, the appropriate power cord should be used. (See Fig. 1.)

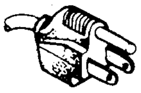
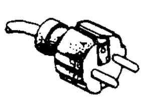
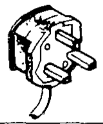
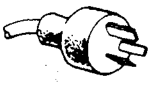
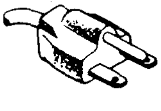
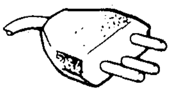
Plug configuration	Power cord and plug type	Factory installed instrument fuse	Line cord plug fuse	Parts No. for power cord and plate
	North American 120 volt/60 Hz Rated 15 amp (12 amp max; NEC)	1.2 A, 250 V Fast blow 6×30 mm	None	Cord: E30-1820-05
	Universal Europe 220 volt/50 Hz Rated 16 amp	North Europe 0.8 A, 250 V Slow blow 5×20 mm Other Europe 0.8 A, 250 V Fast blow 6×30 mm	None	Cord: E30-1819-05
	U.K. 240 volt/50 Hz Rated 13 amp	0.8 A, 250 V Fast blow 6×30 mm	0.8 A Type C	—
	Australian 240 volt/50 Hz Rated 10 amp	0.8 A, 250 V Fast blow 6×30 mm	None	Cord: E30-1821-05
	North American 240 volt/60 Hz Rated 15 amp (12 amp max; NEC)	0.8 A, 250 V Fast blow 6×30 mm	None	—
	Switzerland 240 volt/50 Hz Rated 10 amp	0.8 A, 250 V Fast blow 6×30 mm	None	—

Fig. 1 Power Input Voltage Configuration

CIRCUIT DESCRIPTION

Vertical Attenuator Circuit (X75-1180-01)

The attenuators for channel 1 and channel 2 are operated by the signals from the panel, and AC/DC/GND input coupling and attenuation of 1/1, 1/10, and 1/100 are switched.

The vertical input signal from the BNC input terminal passes through the attenuator and is input to the buffer amp formed by U101 and Q101 (CH2: U201 and Q201). U101 is a source follower and constant current supply and Q101 is for input protection. The input signal is impedance converted by these components and is input to the 1st amp formed by U102 and Q102 (CH2: U202, Q202). A differential signal is created here, and the 1st amp for channel 2 contains an INV circuit that switches the inversion transistor ON/OFF using the data from the R/O unit.

U1 and U2 produce a voltage signal from the serial data from the R/O unit, and this serial data is converted to a 0/5 V parallel signal. Although inversion is not possible on the channel 1 side, the same circuit as the channel 2 circuit is used for circuit stability, and the bias of the inversion transistor is fixed at the off state. The channels 1 and 2 input signals are input to the vertical preamp unit after passing through the 1st amp.

The channels 3 and 4 input signals are input to the 1/1 or 1/5 attenuator as selected by the K301 (CH4 : K401) relay. The signal is then input to the buffer amp formed by Q301 and 302 (CH4: Q401, 402). Q301 is a source follower, Q302 is a constant current supply, and Q303 is for input protection. The signal is impedance converted by this amp. The signal is then input to the 1st amp formed by Q304 and 305 (CH4: Q404, 405). This amplifier produces a differential signal. The channel 3 and channel 4 signals are input to the vertical preamp unit after passing through the 1st amp.

Switch Unit (X69-1150-02)

*** Switch Matrix**

All the tact switches on the panel form a switch matrix. Pins 1, 2, 3, 4, and 15 of U9 are all low when a tact switch is not pressed, and the output (D0 to D7) is at +5 V.

When a switch is pressed, the output of the switch (one of D0 through D7) goes to low due to Pin 15, 1, 2, 3, or 4 of U9 going to low. The output from D0 through D7 is connected to the R/O unit, and when any of these outputs goes to low, an interrupt is applied to the CPU and serial data is sent to U9. U9 which receives data from the R/O unit, first switches all of Pins 15, 1, 2, 3, and 4 to high and then switches each pin to low. The resulting voltage from the output (D0 to D7) is used to determine which switch was pressed.

*** Panel LED**

The corresponding LEDs on the panel are illuminated when Pins 15 and 1 through 7 of U2 through U8 go from high to low. Serial data from the R/O unit is sent to U2 through U8, and the LED to be illuminated is selected according to that signal.

*** Rotary Encoder**

Rotary encoders are used for the VOLTS/DIV and SWEEP TIME controls for channel 1 and channel 2. The data from these encoders is received by the R/O unit. Refer to the section on the R/O unit regarding operation.

Panel Unit (X66-1050-01)

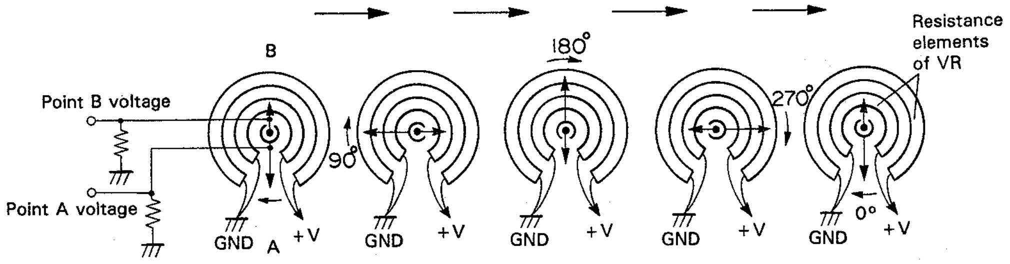
*** VR (VR1 to 10), Uncal Search**

Variable resistors (VR) are used for setting the position, V-variable, trig level, hold off, and T-sep for each channel. Both terminals of each of the VRs are connected to +/−10 V, +10 V and GND, or +5 V and GND, and the set voltage is sent to the various units.

The collector of Q1, 2 (CH1) or Q3, 4 (CH2) goes from 0 V to approximately +5 V when V-VARIABLE is set to the UNCAL state, voltage is supplied to the R/O unit, and the UNCAL mark (●) appears on the screen.

*** Comparator, Endless VR**

Endless VRs are used in four locations: horizontal position, Δ, and Δ REF. As shown in Fig. 1, two resistance elements are used alternately for this operation. The output voltage is received by the R/O unit. U1a supplies stable voltage to each terminal of the endless VRs.



CIRCUIT DESCRIPTION

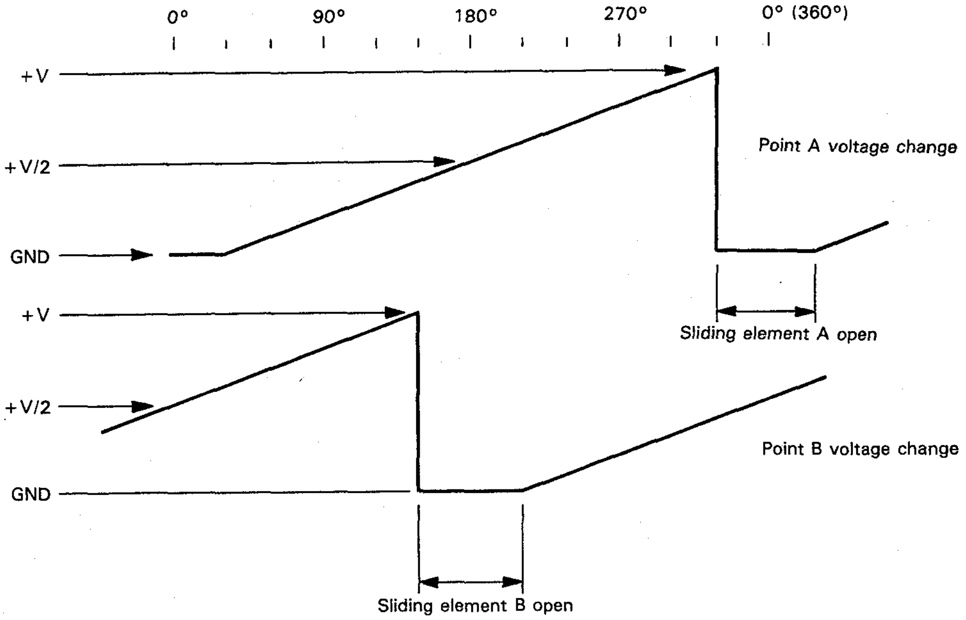


Fig. 1 Endless VR Operation

High Voltage Unit (X68-1510-03)

*** Blanking Circuit**

This is a circuit for amplifying the blanking signal from the horizontal unit. The signal input from P19 passes through the Q8 emitter follower, and is input to Q6 for amplification. Q5 is a constant current supply for Q6 and Q7 is a transistor for absorbing current. Negative feedback is applied to this by R26, and the degree of amplification is determined by R26 and R358 of the horizontal unit. The blanking signal amplified to high voltage is then applied to G1 of the CRT from the high voltage oscillation circuit (described below) using D8 through D10. The G1 potential from K (cathode) is set a low level, and the brightness decreases as this level decreases.

The voltage of the blanking signal of the horizontal unit is altered according to the INT VR of the VR unit, altering the brightness which results.

The output from Q6, ie., the amplified blanking signal, is input to Q4. The brightness is altered by the auto-focus so that the focus point is not lost.

Q3 is a constant current supply for Q4. The signal is then overlapped with the high voltage level using D4 through 7, in the same manner, and the resulting signal is applied to the P1 terminal of the CRT after the potential is controlled by VR23 of the VR unit.

*** High Voltage Oscillation Circuit**

Oscillation at 30 kHz is invoked by Q1, and becomes high voltage by the high voltage block. U1 and Q2 provide negative feedback for control.

Power Supply Unit (X68-1500-01)

The power supply circuits are composed of six regulated output systems (+5, +/−10, +15, +60, and +140 V) and two unregulated systems (+/−13 V).

The regulated outputs are all with reference to −10 V. This −10 V output uses a 5 V Zener diode (D5) as reference, and is obtained by the drive transistor (Q6) and op amp U3. Other regulated output is obtained using op amps (U1, 2, and 3) and transistors (Q1, 3, 5, 6, 7, and 8), with this −10 V output as reference.

The unregulated output of +/−13 V uses the voltage before regulation to obtain regulated output of +/−10 V.

VR Unit (X81-2330-03)

*** Calibration Voltage Generation Circuit**

Op amp U1 is used as an oscillator, and the DC voltage is switched using D1 to generate a 1kHz square wave.

*** Scale Illumination Circuit**

This circuit drives an illumination lamp with the Q6 emitter follower as an output stage. D4 and 5 are used for switching to provide one-shot illumination.

*** Trace Rotation Circuit**

This circuit drives a coil for rotation by the Q2 and 3 emitter followers.

*** Intensity Circuit**

This circuit has three 20kB VRs, A SWEEP, B SWEEP, and R/O, both ends are connected to +/−10 V, and the set voltage is sent to the horizontal unit to create a blanking signal. The R/O VR is equipped with an ON/OFF switch.

CIRCUIT DESCRIPTION

Final Unit (X80-1100-03)

* Vertical Amplification System — Vertical Final Preamp to Vertical R/O Switching to Vertical Final Amp

The signal output from the vertical preamp unit and which passed through the delay line, is input to the vertical amplification system of the final unit. The signal first passes through the Q1 and Q2 emitter followers, and is input to Q3 and Q4 for amplification. Q203 and 204 alternately select Q3 and Q4 that amplify the waveform for output of characters on the CRT screen by the R/O function and Q201 and Q202 which amplify the character information sent from the R/O unit. When the ROREQ signal from the R/O unit is high, Q204 is switched ON, Q3 and 4 are switched ON, Q203 is switched OFF, and Q201 and 202 are switched OFF. The signal is amplified and the character information is not input. When the ROREQ signal is low, the opposite occurs, and the character information is amplified without signal input. The signal then enters the Q5 and 6 base grounded amp, is impedance converted by the Q7 and 8 emitter follower, is input to the final amp formed by Q9, 10, 13, 11, 12, and 14, and is input to the deflection plate of the CRT.

* Horizontal Amplification System — Horizontal Final Preamp to Horizontal R/O Switching to Horizontal Final Amp

The signal sent from the horizontal unit is input to the Q101, 102 base grounded amp, and is amplified by Q103, 104 after passing through D101, 102, 105 and 106 for excessive input limiting. In the same manner as the vertical system, Q208, 209 switches between the amp for signal formed by Q103, 104 and the amp for characters formed by Q206, 207.

Following this, the signal is input to the Q105, 106 base grounded amp, is impedance converted by the Q107, 108 emitter follower, is amplified by Q109, 110, is impedance converted by the Q112, 113 emitter follower, and is input to the Q114, 115 amp. Q116, 117 form a constant current supply to supply a fixed current level to Q114, 115. Negative feedback is applied to the output by R114, 145, 153, and 154, and the degree of amplification is determined by R144, 145, 153, 154 and R152, 133. This configuration provides stability and allows for amplification with high amplitude.

Vertical Preamp Unit (X73-1760-01)

The channel 1 and channel 2 signal output from the ATT unit enter the vertical preamp unit and are first input to the buffer amp formed by Q101 (CH2: Q201). The signals are then input to the X5 and X1 amps. The X5 amp is formed by Q102 (CH2: Q202) and the X1 amp by Q103 and 104 (CH2: Q203, 204). Switching between the amps is by Q105 and 106. When Q105 is ON, Q106 is OFF and the X5 amp is selected. When Q106 is ON, Q105 is OFF and the X1 amp is selected. The signal which passed through Q108, 109 (CH2: Q208, 209) cascade connected to Q102, 103, 104 (CH2: Q202, 203, 204) is input to the 1/1, 1/2, or 1/4 ATT, switched by the K101 (CH2: K201) relay. The signal emerging from the ATT is impedance converted by Q112, 113 (CH2: Q21, 213), and input to Q114, 115 (CH2: Q214, 215). There is a vertical variable circuit formed by R169, 170, U102 (CH2: R269, 270, U201) between the cascade connections. This circuit applies the DC signal for variable control sent from the panel by U101 (CH2: U201) connections. This circuit applies the DC signal for variable control, sent from the panel by U101 (CH2: U201) and varies the gain by varying the impedance of HIC U102 (CH2: U202). The CH1 and CH2 signals emerging from the cascade amp that forms the 3rd amp are impedance converted by the buffer amp formed by Q119, 120 (CH2: 219, 220), and input to the amp for trig signal output (formed by Q601 to 604), Q528 and 529 cascade connected to Q501 and 502. Between the cascode amps, there is an amp for POSI variation by Q503, Q504 (CH2: Q507, 508) and a CH selection circuit formed by Q1 and 2 (CH2: Q3, 4). Although the trigger signal output amp is a balanced circuit using Q601 and 602 (CH2: 605, 606), only Q601 (CH2: Q605) actually extracts the trigger signal, and this component is cascode connected to Q603 (CH2: Q607). Subsequent explanation on this trigger amp will be given below.

* CH3 and 4 3rd Amp to Select SW

Q301 and 302 (CH4: Q401, 402) are cascode connected to Q304 and 305 (CH4: 404, 405) of the attenuator unit, and there are resistors and capacitors for gain control and frequency response correction between them. The signal emerging from the cascode amp enters the buffer amp formed by Q304, 305 (CH4: Q404, 405), is impedance converted, and input to the 1st trig amp.

The input to the trig amp is approximately 50% of the output from the 3rd amp, and a balance circuit is formed by Q609 and 610 (CH4: Q613, 614) for balancing. However, the signal extracted as the trigger signal is actually only the signal from the Q609 side (CH4: Q613). Subsequent explanation on this trigger amp will be given below.

The signal output from the 3rd amp will be input to the trig amp and V. mode select switch. This is formed by Q509, 510 (CH4: Q513, 514) and Q5, 6 (CH4: Q7, 8). When the V. mode is selected, Q5, 6 (CH4: Q7, 8) are OFF, and the signal passes through D505, 506 (CH4: D507, 508), and is input to the mix amp. When this mode is not selected, Q5, 6 (CH4: Q7, 8) are ON, and the signal is canceled. This operation is the same for channels 1 and 2. Q511, 512 (CH4: Q515, 516) between Q509, 510 (CH4: Q513, 514) and Q5, 6 (CH4: Q7, 8) form a POSI variable amp that changes the bias of Q512 (CH4: Q516) to vary the position, according to the DC voltage from the panel.

* Mix Amp to 4-ch Amp to T. SEP Amp to 20 MHz BW SW

The signals that passed through the select switches for the various channels and diodes D501 through 508, are input to the mix amp formed by Q528, 529. Q518 is ON when ADD is selected in the V. mode. The impedance of the signal is then converted by the buffer amp formed by Q519, 520, and input to the T. SEP amp formed by Q522 and 523. In this T. SEP amp, the B SWEEP position is altered by input of a control signal to the base of Q523 for switching so that the amp only operates by the B sweep signal.

The impedance of the signal which passed through the T. SEP amp is converted by the buffer amp formed by Q524, 525, and the signal is input to the delay line. A switch for performing 20 MHz BW is formed by Q526, 527, a low-pass filter is formed by C509, 510, and the circuit functions as a 20 MHz BW. The signal then passes through a delay line and is input to the final unit.

*** 1st Trig Amp — Trig Select — 2nd Trig Amp**

The trigger signal extracted by Q601 and 602 (CH1), Q605 and 606 (CH2), Q609 and 610 (CH3), and Q613 and 614 (CH4) is input to the amps formed by Q603 and 604 (CH1), Q607 and 608 (CH2), Q611 and 612 (CH3), and Q615 and 616 (CH4). It is then input to trig select after impedance conversion. At this time, a portion of the channel 1 signal is split to the CH1 out amp formed by Q621 and 622, and a portion of the channel 2 passes through Q620 and becomes the X signal for the X-Y mode.

Trig select is a switch formed by D601, 602, 603, and Q623 to 621. When the various transistors are switched on by the CH select logic signal, the diode connected to the transistor has reverse polarity and goes off. The diode can be switched on by switching the transistor off, and the trigger signal will be output to the amp in the next stage. D601 receives the A trig, D602 receives the B trig, and D603 receives the line trig.

The trigger signal received by trig select is impedance converted by the 2nd trig amp formed by Q617 and 632 (A trig) and Q618 and 633 (B trig), and is then sent to the horizontal unit.

*** Control of vertical preamp unit**

The following signals are sent from the R/O unit for control of the vertical preamp unit.

(1) Serial data .... this signal is sent from the R/O unit together with the clock signal, and input to U1, U2, U3, U4, U5, U6, U7, and U8 for conversion to parallel data. The following are controlled by this signal:
    X1 and X5 amp switching
    1/1, 1/2, 1/4 ATT switching
    V-MODE switching
    20 MHz BW limit
    Trigger signal selection

(2) Voltage supplied directly from panel .... voltage between 0 V and 10 V is created by the variable resistors on the panel, and is input as a signal to the vertical preamp unit through the R/O unit.
    POSI variation
    V-VAR
    The above are the signals externally input for control.

Horizontal Unit (X74-1480-03)

The trigger signals (ATR, BTR signal) supplied from the vertical preamp unit (X73-1760-01) are input to the trig preamps. The A trig preamp is formed from Q1 and Q2, etc., and the B trig preamp is formed from Q14 and Q15, etc. When a TV signal is input, TV coupling is selected to amplify the TV sync signal. The control signal to perform this is output from U29, and the gain of Q1 and Q14 is changed by switching with Q9 to correspond to the TV sync signal. The trigger level is altered after the signal passes through the trig preamp. The trigger level of A-sweep is altered by U21 and the level of B-sweep by U22. The level is switched by the U16 analog switch by panel switch operation, and the FIX signal, TV signal, and A BLVL signal are selected.

The input signal with trigger level altered is input to the trig amp formed by Q5, Q6, Q7 and Q17, Q18, and Q19. When coupling is set to HFREJ by operation of the panel switch, a control signal is output from U29, Q8 or Q20 is switched on, and the high frequency components are attenuated. The signal is input to the Schmitt circuit formed by U1 or U2 after passing through the trig amp. The hysteresis width of the Schmitt circuit is altered by the noise rejection control signal output from U29, allowing stable triggering even for input signals containing noise. The control signal output from U30 determines whether the slope is positive or negative.

The signal output from the A-sweep Schmitt circuit is input to the auto freerun circuit formed by Q103 and Q104 to control U39 according to the auto or normal mode. This sets the unit to the sweep mode or trigger standby mode.

The AS signal output from Q of U3a is input to Q109 of the A-sweep circuit, performing start and stop control of the A-sweep. U24b in the A-sweep circuit takes the analog voltage supplied from U101 unit and amplifies it to 5 V at range 1, 2.5 V at range 2, and 1 V at range 5. The current is determined by this voltage and the aggregate resistance selected by the U17 analog switch. This determines the sweep time.

The AS signal output from Q of U3a and the BS signal output from Q of U3b are input to the blanking circuit formed by U4, the UNBL signal is generated from ROUBL, ROINT, BINT, AINT, etc., and supplied to the high voltage unit (X68-1500-01).

In the same manner as the A-sweep circuit, U26d in the B-sweep circuit amplifies the analog voltage fed from the R/O unit, and determines the current by the U18 analog switch to determine the sweep time.

The A-sweep signal output from Q116 and the B-sweep signal output from Q134 are input to the mix amp formed by U19, Q302, Q303, Q304, Q306, and Q307. In this circuit, the analog voltage supplied from X10 MAG and the R/O unit are amplified by U27, and H-POSI control is performed. The signals output from this circuit are fed to the final unit (X80-1100-01) as the X+ and X- signals.

Switching between A-sweep and B-sweep is controlled by U7, and this signal is sent to the mix amp and blanking circuit. The switching signal for chopping of A-sweep and B-sweep is generated by the circuit formed by Q403 and Q404. The chop frequency at this time is 500 kHz.

Delayed sweep is performed by comparing the voltage of the A-sweep output from Q116 and the DTP signal supplied from the R/O unit by the delay comparator formed by Q102, U25, etc, and the position to start the B-sweep is determined. The signal to start the B-sweep at this time is input to the logic circuit for B-sweep formed by U13a, b, c, and U6, and the signal to output the BS signal is sent to U3b.

In the single sweep mode, the SGL signal supplied from the R/O unit is input to the A-sweep logic circuit formed by U11b, U12d, and U5, and the A-sweep trigger standby mode is selected when the RESET signal is input.

There is also a 1-shot ILLM circuit which illuminates a lamp for approximately 1 second when the single sweep is completed. This circuit is formed from U12, Q405, Q406, C405, and C406, etc.

CIRCUIT DESCRIPTION

Readout unit (X77-1490-01)

The R/O unit contains an 8-bit Z-80A CPU, and has two major functions: control of the operation of the various sections and the output of CRT character information.

The basic clock which forms the basis for the timing of all IC operations is generated by the 10 MHz oscillator formed by U11d and X1. The 10 MHz CLK is used for operation of U33 (R/O controller), and this clock signal is divided to 1/4 by U10 to create the 2.5 MHz CLK. This clock signal is used for operation of the U5 CPU (Z-80A) and as a control signal for sending data and addresses to U33.

Changes in information from the switch unit (X69-1150-02) and the timing, clock, and soft timers for the CRT display are all realized through interrupts which are sent to the CPU. Changes at the switch unit include interrupts issued when a pushbutton switch is pressed and when the rotary encoders used for VOLTS/DIV and SWEEP/DIV are rotated. When a switched is pressed, one of lines D0 through D7 of U24 connected as a data bus for switch information goes to "L". U14e goes to "L" causing Q of U21a to also go to "L", notifying the CPU that a switch position has been changed. When CRT information is changed by operation of the switches or variable resistors on the panel, the timing for updating the CRT indication is output every 13.5 μs from U33. The change is latched to U21a, and indicated to the CPU as an interrupt. The CPU recognizes this interrupt and performs processing to update the CRT indication.

U12, U13, U17, and U18 form the import section which outputs the data decoded by U6 and U8 to the data bus. U12 is an import IC for evaluating the probe detection (1/1 to 1/10), battery capacity, and status of the CH1 and CH2 variables. Probe detection and variable status is fetched by the CPU approximately every 15 μs, and evaluated and processing performed. The B1 battery capacity is monitored by U46a, and when the level drops below approximately 2.4 V, the status (H level) is fetched from the import at POWER ON, and "BATT DOWN" is displayed on the CRT screen.

U13 is an import IC for interrupt evaluation, and it determines whether an interrupt such as rotary encoder (CH1, CH2, SWEEP), 2 ms, clock, switch, or CRT indication has been transmitted to the CPU.

U17 receives the A-phase and B-phase status of the rotary encoder, receives and evaluates the movement of the endless VR, and receives and evaluates the single ready state. Reception and evaluation of the endless VR movement is made by having U35 compare the endless VR voltage and D/A converter (U37) voltage, to determine whether the endless VR has been rotated. U18 is an IC for fetching data from the panel switches, and it receives the state when a switch is pressed.

U6 through U9 are a decoder circuit, and U6 uses PAL. The PAL has a circuit configuration capable of decoding the import and output clocks, ROM, and RAM. U7 through U9 decode individual information selected by U9.

U8 outputs the decoded information from inport U12, 13, 17, and 18, and the latch CLK (VLC, HLC, ALC, and LLC) for serial transfer.

U19 outputs the latch CLK (SLC) for serial transfer and the shift CLK (ASC, LSC, SSC, HSC, VSC).

U7 outputs the data latch CLK for serial transfers, the interrupt latches (U20, U21, U22, and U23), and the RESET pulse. The data latch CLK is also used as the CLK for latching the data for serial transfers by U16.

A blanking signal is applied during serial transfer to prevent the effects of noise on the waveform. This blanking is output from Pin 21 of U33.

U1 is RAM, and 8 K×8 bit memory is used. This SRAM is backed up by B1 when the power is off, and the power is switched by U19 when the power is turned on/off. Switching is performed by the U4 power reset IC, and a reset signal is supplied to U3, U5, and U19 at 4.4V +/−0.2 V.

U2 is a software ROM, and both 16 K and 32 K can be used by switching by R128 and R256.

Although CTM5020 (U33) can be directly connected to 8080-type CPUs, direct connection of address and data is not possible with the Z-80 due to the absence of an ALE terminal. For this reason an ALE signal is generated by the ADD/DATA SELE circuit formed by U27, U28, U23b, U14b and d, U25b, and U29c to allow connection with U33.

The software timer needed for CPU operation is created by U26 as a 2 ms timer. This is latched to U20a every 2 ms to indicate an interrupt to the CPU.

U3 is backed up by lithium battery B1 when the power is off, and the 32.768 kHz basic clock from the crystal oscillator operates. An interrupt signal is output from U3 once every minute, and is latched to U20b. The calender indication on the CRT is advanced one minute by the input of this interrupt.

The U37 D/A convertor creates the voltage output for endless VR comparison, the analog control voltage used by the horizontal unit (X74-1480-03), and the cursor control voltage. The latter control voltage is switched by the U41 analog switch, and is output once every 4 ms by time division. This output control is performed by AX0 through AX3 of U33, and AX3 is a control terminal to prevent the comparison voltage being output to the control voltage when this voltage for endless VR comparison is output from the U37 D/A convertor.

The cursor control voltage (Δ and Δ REF) output from U41 is switched with R/O-Y and R/O-X by the U40 and 43 analog switches, and output to the final amp.

There are analog control voltages used by the horizontal unit: B-vari, DTP, and H-posi.

B-vari output the reference voltages for sweep B, and the voltage determined by the 1-2-5 range is output (during CAL). During UNCAL, the B-vari voltage changes and the sweep time changes. At this time, the voltage is changed so that the amount of variation changes at the various ranges so that variation rate corresponds to the rotational speed of the endless VR. The count distribution is 2000 for range 1, 1000 for range 2, and 400 for range 5, and the amount of change per step is altered every 10, 6, and 2 counts respectively. B-vari passes through the U47a buffer amp before it is fed to the horizontal unit (X74-1480-03).

The following is a description of the operation of the rotary encoder used for switching volts/div and sweep time. The rotary encoder has two outputs, and rotation to the right or left is determined by the output resulting from the phase difference.

CIRCUIT DESCRIPTION

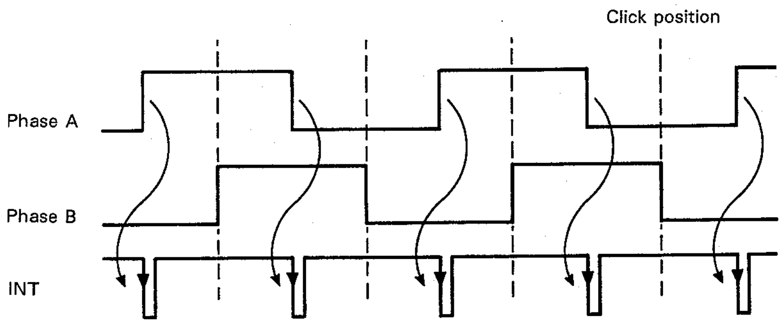


Fig. 2

Figure 2 shows the output waveforms of the rotary encoder, and phases A and B have the output waveforms indicated. In the case of the CH1 VOLTS/DIV rotary encoder, for example, the outputs from phases A and B are input to U29b and U31c respectively. U29 and U31 form a Schmitt circuit, eliminating chattering occurring when the rotary encoder is rotated, and shaping the waveforms to resemble those shown in the above diagram. (This is performed to prevent spurious operation.)

The signal with the waveform shaped is input to U30c, output as the INT signal shown in Figure 2. Q of U22a goes to "L" at the point indicated by the arrow and an interrupt signal is sent to the CPU. When the CPU enters the interrupt state, it immediately evaluates the status of phases A and B, determines the rotation to the right or left by the status of the change, and performs the appropriate processing. (The figure shows rotation to the right.)

U31a and U31b form the Schmitt for the CH2 VOLTS/div rotary encoder, U30d receives the signal after waveform shaping, and U23a receives the INT signal. U31d and U30a form the Schmitt for the CH2 Sweep Time/div rotary encoder, U30b receives the signal after waveform shaping, U22b receives the INT signal.

The DTP adds two analog voltages and is a 5000 count FS. These analog voltages are V-Delay and C-Delay. V- Delay is counted up to 4000 counts with C-Delay as 0 V, and is added by U45b. Following this, V-Delay and C-Delay are decreased one count each until 5000 counts are reached. This is equivalent to doubling the D/A resolution. The added DTP voltage passes through the U46b buffer amp, and is fed to the horizontal unit (X74-1480-03).

The voltage from the endless VRs used for cursor, H-POSI is received by the U34 analog switch, and the control signal for selecting the endless VR is selected by VX0 to VX2 of U33. The output of the endless VR selected by U34 is input to U35, and compared with the voltage output from D/A convertor U37 by U35. As the U37 D/A convertor is a 12-bit unit and 8 bits are output to the D/A (U33 DA0 to DA7), the upper 4 bits are latched by U36 and the remaining 8 bits are then output. The discrete circuit formed by Q1, Q2, etc., and connected to Pin 17 of U37 is a DC-DC convertor circuit used to supply -11 V to the D/A convertor.

The H-POSI voltage is supplied to the horizontal unit through the hold circuit.

A random can method (X-Y display) is used for character display, and the U32 character generator is controlled by the character counter of the U33 R/O controller and the dot counter.

One cycle for readout indication is divided into four, and consists of lower characters, upper characters, Δ REF cursor, and Δ cursor.

Character data having a basic configuration of 5×7 dots is input to the U32 character generator. The 3 bits from DO0 to DO2 are X-axis data, the four bits DO3 to DO6 are the Y-axis data, and DO7 is the character start/end control signal. The digital signal output from U32 is converted to the analog voltages by the U42 D/A convertor for the X-axis signal and the D/A convertor for the Y-axis signal formed by U39 and R58. These signals pass through analog switches U40 and U43, the U44 buffer amp, and are supplied to the final unit (X80-1100-03) as the R/O-X and R/O-Y character signals.

Character dot display on the CRT is controlled by the ROUB, ROB, and ROQ signals output from Pins 86, 87, and 88 of U33.

The ROB signal erases the real waveform display, the real waveform and readout are switched by the ROQ signal, and dot indication on the readout is performed by the ROUB signal.

CIRCUIT DESCRIPTION

TV Counter Unit (X76-1400-00)

The TV signal is input through pin 7 of P35, and the polarity is selected by U1a. When the base of Q4 is "L", Q2 goes ON and U1a becomes an inverted amplifier. The signal output from pin 1 of U1a passes through buffer amp U1b, clamps the sync signal at D1, and enters video amp U2. Then, the signal output from pin 7 of U2 is subjected to peak detection at D6 in order to maintain the amplitude of the output from pin 7 of U2 constant by controlling Q1. Q3 is the circuit which goes ON in other modes than the TV COUNT mode to cut the TV signal. The signal output from pin 7 of U2 is input to sync separator circuit U3. U4a is the circuit for extracting the equivalent pulse of horizontal sync signal. The pulse is supplied through gate U7 and used as the clock pulse of the TV counter circuit.

U5b detects the TV signal input and controls the auto-freerun circuit. U5a is the detector circuit of the interlaced, progressive signal.

U4b is the circuit which generates equivalent vertical sync signal when the progressive signal is input.

The output signal from U6a is differentiated by U7, sent through U6b, and output from pin 4 of P35 as the TV counter load pulse.

U8 is the shift register which loads and latches the serial data from the R/O.

U8 pin No.

1: "H" in TV counter mode, otherwise "L".
2: "L" in TV counter mode, otherwise "H".
3: "H" when A sweep time is between 0.2 ms/div and 20 ns/div in TV counter mode, otherwise "L".
15: "L" when TV is +SLOPE, "H" with −SLOPE.

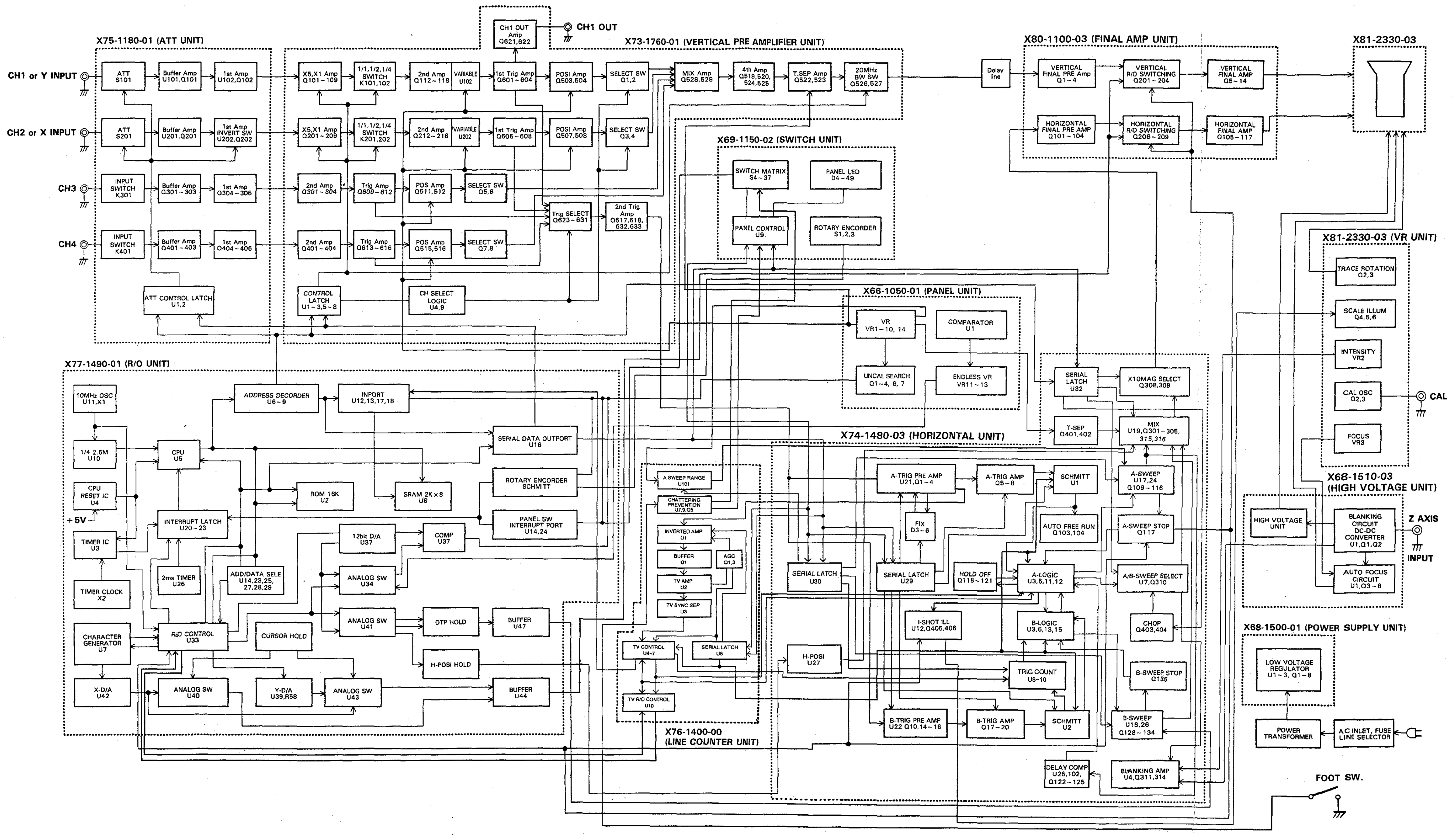
U10 is the circuit which eliminates a flicker of waveform in TV counter mode, and which also controls U33 (X77-1490-01).

* Chattering prevention circuit

The signal input to pin 1 of P36 as the program count-up signal is sent through the protector circuit of D7 and D8, and input to pin 1 of U9. When the signal is input to U9, its pin 4 outputs pulse for the specified period of time, during which chattering can be prevented. The output signal passes through D10, Q5 and U7, and controls D1 of the panel unit (X66-1050-01) and pin 5 of U9 to increment the count of the program.

D9 is the diode used to maintain the output "H" while the input signal level is "L" regardless of the time constant of U9.

BLOCK DIAGRAM



X75-1180-01 (ATT UNIT)
CH1 or Y INPUT
CH2 or X INPUT
CH3
CH4
ATT S101
ATT S201
INPUT SWITCH K301
INPUT SWITCH K401
Buffer Amp U101,Q101
Buffer Amp U201,Q201
Buffer Amp Q301~303
Buffer Amp Q401~403
1st Amp U102,Q102
1st Amp INVERT SW U202,Q202
1st Amp Q304~306
1st Amp Q404~406
ATT CONTROL LATCH U1,2
CH1 OUT Amp Q621,622
CH1 OUT
X73-1760-01 (VERTICAL PRE AMPLIFIER UNIT)
X5,X1 Amp Q101~109
X5,X1 Amp Q201~209
2nd Amp Q301~304
2nd Amp Q401~404
1/1,1/2,1/4 SWITCH K101,102
1/1,1/2,1/4 SWITCH K201,202
Trig Amp Q609~612
Trig Amp Q613~616
2nd Amp Q112~118
VARIABLE U102
2nd Amp Q212~218
VARIABLE U202
POS Amp Q511,512
POS Amp Q515,516
1st Trig Amp Q601~604
1st Trig Amp Q605~608
SELECT SW Q5,6
SELECT SW Q7,8
POSI Amp Q503,504
POSI Amp Q507,508
Trig SELECT Q623~631
2nd Trig Amp Q617,618, 632,633
SELECT SW Q1,2
SELECT SW Q3,4
MIX Amp Q528,529
4th Amp Q519,520, 524,525
T.SEP Amp Q522,523
20MHz BW SW Q526,527
CONTROL LATCH U1~3,5~8
CH SELECT LOGIC U4,9
Delay line
X80-1100-03 (FINAL AMP UNIT)
VERTICAL FINAL PRE Amp Q1~4
VERTICAL R/O SWITCHING Q201~204
VERTICAL FINAL AMP Q5~14
HORIZONTAL FINAL PRE AMP Q101~104
HORIZONTAL R/O SWITCHING Q206~209
HORIZONTAL FINAL AMP Q105~117
X81-2330-03
X69-1150-02 (SWITCH UNIT)
SWITCH MATRIX S4~37
PANEL LED D4~49
PANEL CONTROL U9
ROTARY ENCORDER S1,2,3
X66-1050-01 (PANEL UNIT)
VR VR1~10, 14
COMPARATOR U1
UNCAL SEARCH Q1~4, 6, 7
ENDLESS VR VR11~13
X81-2330-03 (VR UNIT)
TRACE ROTATION Q2,3
SCALE ILLUM Q4,5,6
INTENSITY VR2
CAL OSC Q2,3
CAL
FOCUS VR3
X77-1490-01 (R/O UNIT)
10MHz OSC U11,X1
1/4 2.5M U10
CPU RESET IC U4
+5V
TIMER IC U3
TIMER CLOCK X2
CHARACTER GENERATOR U7
X-D/A U42
CPU U5
INTERRUPT LATCH U20~23
2ms TIMER U26
ADD/DATA SELE U14,23,25, 27,28,29
R/O CONTROL U33
CURSOR HOLD
ANALOG SW U40
Y-D/A U39,R58
ANALOG SW U43
ADDRESS DECORDER U6~9
INPORT U12,13,17,18
ROM 16K U2
SRAM 2K×8 U8
12bit D/A U37
COMP U37
ANALOG SW U34
ANALOG SW U41
DTP HOLD
H-POSI HOLD
BUFFER U47
BUFFER U44
SERIAL DATA OUTPORT U16
ROTARY ENCORDER SCHMITT
PANEL SW INTERRUPT PORT U14,24
A SWEEP RANGE U101
CHATTERING PREVENTION U7,9,Q5
INVERTED AMP U1
BUFFER U1
AGC Q1,3
TV AMP U2
TV SYNC SEP U3
TV CONTROL U4~7
SERIAL LATCH U8
TV R/O CONTROL U10
X76-1400-00 (LINE COUNTER UNIT)
X74-1480-03 (HORIZONTAL UNIT)
SERIAL LATCH U32
X10MAG SELECT Q308,309
T-SEP Q401,402
MIX U19,Q301~305, 315,316
A-TRIG PRE AMP U21,Q1~4
A-TRIG AMP Q5~8
SCHMITT U1
A-SWEEP U17,24 Q109~116
FIX D3~6
AUTO FREE RUN Q103,104
A-SWEEP STOP Q117
SERIAL LATCH U30
SERIAL LATCH U29
HOLD OFF Q118~121
A-LOGIC U3,5,11,12
A/B-SWEEP SELECT U7,Q310
I-SHOT ILL U12,Q405,406
B-LOGIC U3,6,13,15
CHOP Q403,404
H-POSI U27
TRIG COUNT U8~10
B-SWEEP STOP Q135
B-TRIG PRE AMP U22 Q10,14~16
B-TRIG AMP Q17~20
SCHMITT U2
B-SWEEP U18,26 Q128~134
DELAY COMP U25,102, Q122~125
BLANKING AMP U4,Q311,314
X68-1510-03 (HIGH VOLTAGE UNIT)
HIGH VOLTAGE UNIT
BLANKING CIRCUIT DC-DC CONVERTER U1,Q1,Q2
AUTO FOCUS CIRCUIT U1,Q3~8
Z AXIS INPUT
X68-1500-01 (POWER SUPPLY UNIT)
LOW VOLTAGE REGULATOR U1~3, Q1~8
POWER TRANSFORMER
AC INLET, FUSE LINE SELECTOR
FOOT SW.

ADJUSTMENT

To obtain the best performance, periodically calibrate the unit. Sometimes, only one mode need be calibrated, while at other times, all modes should be calibrated. When one mode is calibrated, it must be noted that the other modes may be affected. When calibrating all modes, perform the calibration in the specified sequence.
The following calibration required an accurate measuring instrument and an insulated adjusting flat blade screwdriver. If they are not available, contact your dealer. For optimum adjustment, turn the power on and warm up the scope sufficiently (more than 30 minutes) before starting.
Before calibrating the scope, check the power supply voltage.

TEST EQUIPMENT REQUIRED

The following instrument or their equivalent should be used for making adjustment.

Test Equipment	Model	Minimum Specification
Digital Multi-Meter	DL-706 (KENWOOD)	Impedance: More than 10 MΩ, Measuring range: 0.01 V to 199 V
Sine-Wave Generator	651 B (YHP)	Frequency: 10 Hz to 10 MHz, constant voltage over tuning range
Sine-Wave Generator	SG-503 (Tektronix)	Frequency: 50 kHz to 100 MHz, Output impedance: 50 Ω, constant voltage over tuning range
Square-Wave Generator	PG-506 (Tektronix)	Output signal: 1 kHz, Amplitude: 10 mVp-p to 10 Vp-p, Accuracy: within ±1%, Rise time: 35ns or less 100 kHz, Rise time: 1 ns or less
Q Meter	4343B (YHP)	–
Color Pattern Generator	CG-911A (KENWOOD)	–
Oscilloscope	475A (Tektronix)	Sensitivity: more than 5 mV Frequency response: More than 250 MHz
Time-Marker Generator	TG-501 (Tektronix)	Time mark: 0.5 s to 0.1μs repetive waveform
High-Voltage Probe	–	Input Impedance: 1000 MΩ
Termination	–	Impedance: 50 Ω Accuracy: within 3%
Termination	–	3 watts type impedance: 50 Ω
Attenuator	–	–20 dB attenuation (50 Ω)

Table 1

PREPARATION FOR ADJUSTMENT

Control Settings

The control settings listed below must be used for each adjustment procedure.
Exceptions to these settings will be noted as they occur.
After completing a adjustment, return the controls to the following settings.

NAME OF KNOBS	POSITION
INTEN	12 o'clock, A INTEN
READOUT INTEN	Fully counterwise
FOCUS, ASTIG	Optimum position
CH1, CH2, CH3, CH4 ▲▼ POSITION	Mechanical center
◄► POSITION/×10MAG	Mechanical center/OFF
VARIABLE, H.VARIABLE (VOLTS/DIV, SWEEP TIME/DIV)	CAL
AC-GND-DC (CH1 and CH2)	DC (GND: ON)
VERTICAL MODE	CH1
A.TRIGGERING COUPLING	AC
A.TRIGGERING SOURCE	VERT and CH1
TRIGGERING LEVEL	Mechanical center
TRIGGERING MODE	AUTO
VOLTS/DIV (CH1 and CH2)	10 mV/DIV
SWEEP TIME/DIV	1 ms/DIV
HORIZONTAL MODE	A
CH3, CH4	0.1 V
TRIG.COUNT	OFF
DELAY POSITION	OFF

Table 2

ADJUSTMENT

1. POWER SUPPLY & CRT SECTION ADJUSTMENTS

Item	Adjustment VR (TC)	P.C.B.	Procedure
–10 V	VR1	X68-1500	Adjust VR1 so that the voltage at pin 8 of the connector P17 is –10.00 V.
Intensity	VR1	X68-1510	Display the spot on the CRT screen, and adjust VR1 so that the spot disappears when the INTEN knob is set to the 9 o'clock position.
Focus Center	VR2	X68-1510	Push the FOCUS knob in (for the FOCUS operation) and then set it to the mechanical center position. Pull the knob out (for the ASTIG operation), display a spot on the screen, and adjust the ASTIG control and VR2 to minimize the dimension of the spot.
CRT Center	VR513	X73-1760	VERTICAL MODE: CH1, CH2, ADD Make the luminescent line overlap at each ▲▼ position. Adjust VR513 so that the luminescent line is moved to the center of the CRT screen.
Vertical Center Voltage	VR3	X80-1100	Turn off R/O. In the state of CRT Center Adjustment, adjust VR3 so that the voltage at pin 1 of the connector P14 becomes 34.5 V.
Horizontal Center Voltage	VR102	X80-1100	Engage the CH1 mode. Activate the X-Y operation mode, and set so that the spot moves to the center of the CRT. Adjust VR102 so that the voltage at pin 1 of the connector P15 becomes 67.5 V.
R/O Vertical Gain	VR4	X80-1100	Set the ΔV VR control to "MIN" and "MAX" (↺ ↻) in turns. Adjust VR4 so that the separation between these two settings for the cursor is of 8 divisions of the scale.
R/O Vertical Position	VR201	X80-1100	In the state of the R/O Vertical Gain Adjustment, adjust VR201 to meet the following scale values: 0 division –↺ 8 divisions –↻
R/O Horizontal Gain	VR101	X80-1100	Set the ΔT VR control to "MIN" and "MAX" (↺ ↻) in turns. Adjust VR101 so that the separation between these two settings for the cursor is of 10 divisions of the scale.
R/O Horizontal Position	VR202	X80-1100	In the state of R/O Horizontal Gain Adjustment, adjust VR202 to meet the following scale values: 0 division –↺ 10 divisions –↻

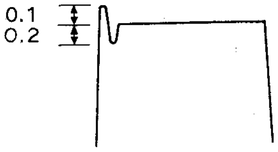
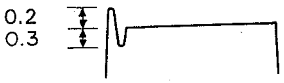
2. VERTICAL SECTION ADJUSTMENTS

Item	Adjustment VR (TC)	P.C.B.	Procedure
CH2 INV Balance	VR201	X75-1180	Adjust VR201 so that even when the CH2 INV switch is turned ON/OFF repeatedly, the luminescent lines does not move.
CH2 INV Position	VR101	X75-1180	Short between pin 1 and pin 3 at P5. Set the vertical mode to "CH1", "CH2", then "ADD". Set it to the scale center by "▲▼ POSITION". Remove the short-circuiting. Adjust VR101 so that the deviated luminescent line comes to the scale center.
CH1 Step ATT Balance	VR103 VR101	X73-1760	Adjust VR103 so that the position of the luminescent line does not change even when the vertical attenuator is selected between 1 and 2 mV range. Switch the range between 2 and 5 mV ranges, and perform the same adjustment using VR101. Make the adjustment in the 5 mV range with refarence to the 2 mV range.

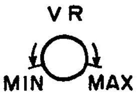
ADJUSTMENT

Item	Adjustment VR (TC)	P.C.B.	Procedure
CH2 Step ATT Balance	VR203 VR201	X73-1760	Adjust in the same way as for CH1.
CH1 Position Center	VR503	X73-1760	CH1 POSITION : Mechanical center position CH1 VOLTS/DIV : 10 mV Adjust VR503 so that the trace is located on the center of the screen.
CH2 Position Center	VR506	X73-1760	Adjust in the same way as for CH1.
CH3 Position Center	VR509	X73-1760	Adjust in the same way as for CH1.
CH4 Position Center	VR512	X73-1760	Adjust in the same way as for CH1
CH1 Variable Balance	VR104	X73-1760	Adjust VR104 so that the position of the luminescent line does not change even if the VARIABLE knob is rotated. Vary the settings of the VOLTS/DIV and VARIABLE controls and see if the trace position also moves; if it does, adjust VR103, 101 and 104 again.
CH2 Variable Balance	VR204	X73-1760	Adjust in the same way as for CH1.
CH1 Gain	VR501	X73-1760	CH1 VOLTS/DIV: 10 mV Input a square wave signal having an amplitude of 50 mV, and adjust VR501 so that the CRT amplitude becomes 5 div.
CH1 1 mV Range Gain	VR102	X73-1760	CH1 VOLTS/DIV: 1 mV Input a square wave signal having an amplitude of 5 mV, and adjust VR102 so that the CRT amplitude becomes 5 div.
CH2 Gain	VR504	X73-1760	Adjust in the same way as for CH1.
CH2 1 mV Range Gain	VR202	X73-1760	Adjust in the same way as for CH1.
CH3 Gain	VR507	X73-1760	CH3 VOLTS/DIV: 0.5 V Input a square wave signal having an amplitude of 0.5 V, and adjust VR507 so that the CRT amplitude becomes 5 div.
CH4 Gain	VR510	X73-1760	Adjust in the same way as for CH3.
CH1 Waveform Shaping	TC105 TC103	X75-1180	AC-GND-DC: DC Apply 1 kHz square wave to CH1 input (with the amplitude extending over 4 to 6 div). Set CH1 VOLTS/DIV to 0.1 V range (and 1 V range), and adjust TC105 (and TC103) so that the waveform becomes flat in both ranges.
CH1 Input Capacity	TC104 TC102	X75-1180	AC-GND-DC : DC CH1 VOLTS/DIV : 10 mV Connect the capacity meter to the CH1 input, and measure the input capacity in the 10 mV range. Adjust TC104 and TC102, alternately, so that the input capacity in the 0.1 V and the 1 V ranges equals the same capacity as in the 10 mV range.
CH2 Waveform Shaping	TC205 TC203	X75-1180	Adjust in the same way as for CH1.
CH2 Input Capacity	TC204 TC202	X75-1180	Adjust in the same way as for CH1.
CH3 Waveform Shaping	TC302	X75-1180	Apply 1 kHz square wave to CH1 input (with the amplitude extending over 4 to 6 div). Set CH3 volts/div to 0.5 V range, and adjust TC302 so that the waveform becomes flat.

ADJUSTMENT

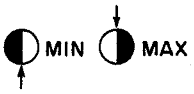
Item	Adjustment VR (TC)	P.C.B.	Procedure
CH3 Input Capacity	TC301	X75-1180	Connect the capacity meter to the CH3 input, and measure the input capacity in the 0.1 V range. Adjust TC301, so that the input capacity in the 0.5 V range equals the same capacity as in the 0.1 V range.
CH4 Waveform Shaping	TC402	X75-1180	Adjust in the same way for CH3.
CH4 Input Capacity	TC401	X75-1180	Adjust in the same way for CH3.
CH1 Square Wave Characteristics	TC101 TC501 VR502	X73-1760	CH1, 2 VOLTS/DIV : 10 mV CH1, 2 AC-GND-DC: DC SWEEP TIME/DIV : 1 μs VERTICAL MODE : CH1 TRIG. SOURCE : VERT HORIZONTAL MODE : A V. VARIABLE : CAL • Input a 1 MHz square wave signal into CH1 (with a CRT amplitude of 6 div.). * Adjust TC101 so that the overshoot is maximized. * Set a TC or the VR to an adjustment angle as shown in Figure 1 or 2 to bring about +0.1/−0.1 division of the scale. • Input the 1 MHz square wave signal into CH2 (with the CRT amplitude of 6 div.). * Adjust TC201 so that the overshoot is maximized. * Set a TC or the VR to an adjustment angle as shown in Figure 1 to bring about +0.1/−0.2 division of the scale. 
	TC1 TC2 VR1	X80-1100	
	TC101	X75-1180	
CH2 Square Wave Characteristics	TC201 TC502 VR505	X73-1760	
	TC201	X75-1180	
CH3 Square Wave Characteristics	TC503 VR508	X73-1760	CH3, 4 VOLTS/DIV : 10 mV * Set a TC or VR to an adjustment angle as shown in Figure 1 to bring about +0.2/−0.3 division of the scale. 
CH4 Square Wave Characteristics	TC504 VR511	X73-1760	

ADJUSTMENT



"MIN": Rotated fully counterclockwise
"MAX": Rotated fully clockwise

TC (without lock mechanism)



Counterclockwise rotation: Unclear waveform ⎍ (Under)
Clockwise rotation: Clear waveform ⊓ (over)

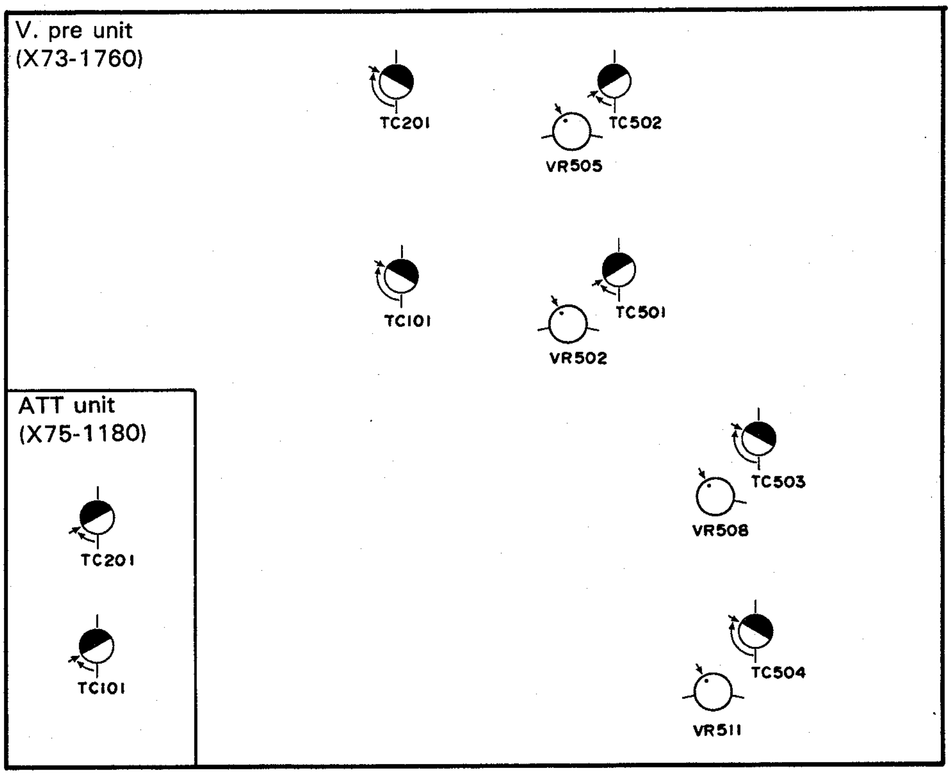

V. pre unit
(X73-1760)
TC201
TC502
VR505
TC101
TC501
VR502
ATT unit
(X75-1180)
TC201
TC101
TC503
VR508
TC504
VR511

Fig. 1

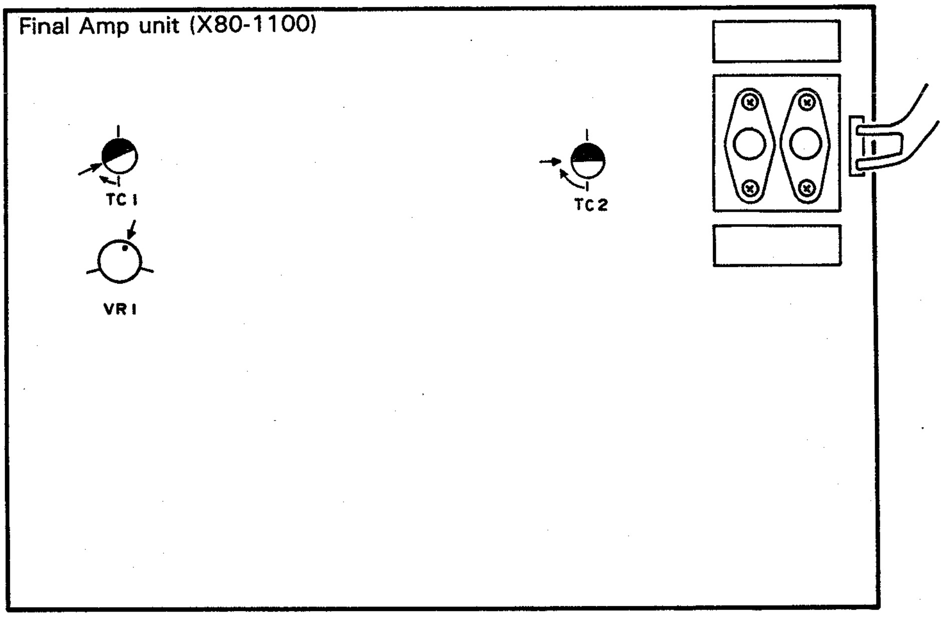
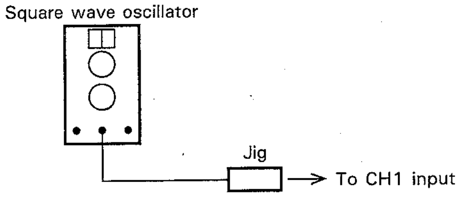
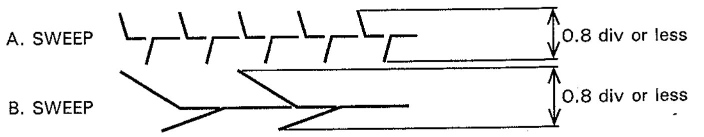

Final Amp unit (X80-1100)
TC1
VR1
TC2

Fig. 2

ADJUSTMENT

3. TRIGGER SECTION ADJUSTMENTS

Item	Adjustment VR (TC)	P.C.B.	Procedure
FIX Level Center	VR1	X74-1480	VERTICAL MODE : CH1 AC-GND-DC : DC TRIG. SOURCE : VERT V. VARIABLE : CAL HORIZONTAL MODE : A SWEEP TIME/DIV : 0.2 ms CH1 VOLTS/DIV : 0.1 V Input a 1 kHz sine wave into CH1, and adjust the oscillator so that the CRT amplitude becomes 6 div. Adjust VR1 so that start point of the luminescent line is at the center of the CRT (vertical direction).
A TRIG. DC Coupling	VR601(CH1) VR602(CH2) VR603(CH3) VR604(CH4)	X73-1760	After adjusting the trigger level center, set the TRIGGERING COUPLING to the DC position. Adjust VR601 so that the start point of the luminescent line is at the same position as in the AC mode.
B TRIG. Level Center	VR4	X74-1480	VERTICAL MODE : CH1 B. COUPLING : AC TRIG. SOURCE : VERT SWEEP TIME/DIV : 0.2 ms HORIZONTAL MODE : B LEVEL : Mechanical center CH1 VOLTS/DIV : 0.1 V Input a 1 kHz sine wave to CH2, and adjust the oscillator so that the CRT amplitude becomes 6 div. Adjust VR4 so that start point of the luminescent line is at the center of the CRT (vertical direction).
B TV sensitivity	VR3	X74-1480	V. MODE : CH1 TRIG. SOURCE : VERT AC-GND-DC : DC VOLTS/DIV : 0.2 V SWEEP TIME/DIV : A 10 µs. B 5 µs HORIZONTAL MODE : ALT A. COUPLING : TV LINE Connect the jig to CH1 and apply 100 kHz square wave through the jig. Adjust SLOPE +/− until triggering occurs. Perform the adjustment until the triggering amplitude becomes 0.8 div or less.  

ADJUSTMENT

4. HORIZONTAL SECTION ADJUSTMENTS

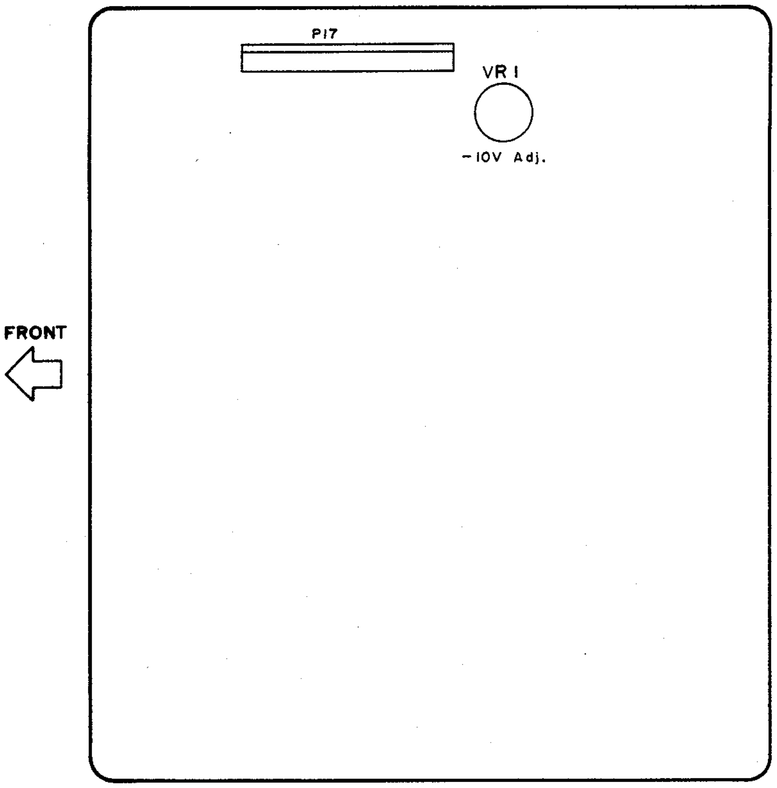
Item	Adjustment VR (TC)	P.C.B.	Procedure
A SWEEP Time	VR301	X74-1480	SWEEP TIME/DIV: 1 ms Input a 1 ms marker signal into CH1. Adjust VR301 so that the peak of the marker signal matches the CRT scale divided in 1 div.
	VR307	X74-1480	SWEEP TIME/DIV: 1 ms Input a 1 ms marker signal into CH1, and match the peak of the marker signal with the CRT scale divided in 1 div. Set to the X10 MAG status, and adjust VR307 so that the interval between peaks becomes 10 div.
	VR103	X80-1100	SWEEP TIME/DIV: 0.2 μs Input a 0.2 μs marker signal into CH1. Set to the X10 MAG status, and adjust the horizontal POSITION so that the peak of the waveform is at the vertical scale line at the center of the CRT. Release the X10 MAG mode and adjust VR103 so that the peak of the waveform matches the vertical scale line at the center of the CRT.
	TC101	X74-1480	SWEEP TIME/DIV: 2 μs Adjust TC101 in the same way as for 1 ms adjustment.
	TC302		SWEEP TIME/DIV: 20 ns Adjust TC302 in the same way as for 1 ms adjustment.
	TC103	X80-1100	SWEEP TIME/DIV: 50 ns X10 MAG : ON Input a 5 ns marker signal into CH1. Adjust TC103 so that the peak of the marker signal matches the CRT scale divided in 1 div.
	TC101	X80-1100	SWEEP TIME/DIV: 20 ns X10 MAG : ON Input a 2 ns sine wave signal into CH1. Adjust TC101 so that the peak of the marker signal matches the CRT scale divided in 2 div. Repeat this adjustment for 20 ns, 5 ns, then 2 ns to obtain optimum point.
B SWEEP Time	VR302	X74-1480	SWEEP TIME/DIV: 1 ms Input a 1 ms marker signal into CH1. Adjust VR302 so that the peak of the marker signal matches the CRT scale divided in 1 div.
	VR104	X74-1480	SWEEP TIME/DIV: 1 ms ~ 5 ms Input a 1 ms ~ 5 ms signal into CH1, and adjust in the same way as for 1 ms
	TC102	X74-1480	SWEEP TIME/DIV: 2 μs Input a 2 μs marker signal into CH1, and adjust in the same way as for 1 ms adjustment.
	TC303	X74-1480	SWEEP TIME/DIV: 20 ns Input a 20 ns marker signal into CH1, and adjust in the same way as for 1 ms adjustment.

ADJUSTMENT

Item	Adjustment VR (TC)	P.C.B.	Procedure
A Sweep Position	VR304	X74-1480	HORIZ. MODE : A SOURCE : VERT VERTICAL MODE : CH1 A SWEEP TIME/DIV : 1 ms TRIG. MODE : AUTO Apply a 1 ms marker signal to CH1 to display a waveform to the center of the CRT screen. Rotate the ◄► POSITION control to maximum clockwise. Measure the deviation between the starting point of the trace and the center of the graticule line. Next, rotate the ◄► POSITION control to maximum counterclockwise and measure the distance between the 12th peak of the waveform and the center of the graticule line. Adjust VR304 so that these deviations will have the same width.
B Sweep Position	VR305	X74-1480	HORIZ. MODE : ALT SLOPE : + A, B INTEN : Fully counterwise Operate ▲▼ TRACE SEP control to separate the A sweep and B sweep. Set the A VARIABLE to CAL. Adjust VR305 to align the starting point of B sweep with that of A sweep in the horizontal position.
X Gain	VR303	X74-1480	CH2 VOLTS/DIV : 10 mV CH2 AC-GND-DC : AC HORIZONTAL MODE : X-Y V. VARIABLE : CAL Input the square wave signal having an amplitude of 50 mV into CH2, and adjust VR303 so that the CRT amplitude in the horizontal direction becomes 5 div.
X Position	VR306	X74-1480	VERTICAL MODE : CH1 TRIG. SOURCE : CH1 CH1/CH2 AC-GND-DC : GND HORIZONTAL MODE : A SWEEP TIME/DIV 1 ms Set the scope controls to display a trace to the graticule center. Adjust VR306 to position to trace to horizontal graticule when switched the HORIZ. MODE switch to X-Y position. Clockwise rotation of channel 1 position control should move up to 5 divisions upward and counterclockwise rotation should move up to 5 divisions downward.
Delay time	VR101 VR102	X74-1480	HORIZ. MODE : ALT CH1/CH2 AC-GND-DC : GND A SWEEP TIME/DIV : 1 ms B SWEEP TIME/DIV : 0.2 μs Rotate the DELAY POSITION control to 0.20 position and set the scope controls to coincide A trace with the left end of the graticule scale, using the horizontal position control. Adjust VR101 to position B trace (intensified portion) to 0.2 div position. Adjust VR102 to position B trace to 10 div. position (right end of the graticule scale) when rotated the DELAY POSITION control to 10.00 position.
CAL Voltage	VR5 VR6	X81-2330	Apply a CAL signal to channel 1 input. Adjust VR5 so that one period becomes 0.1 ms (10 div). Adjust VR6 so that the amplitude becomes 0.2 V (5 div.)

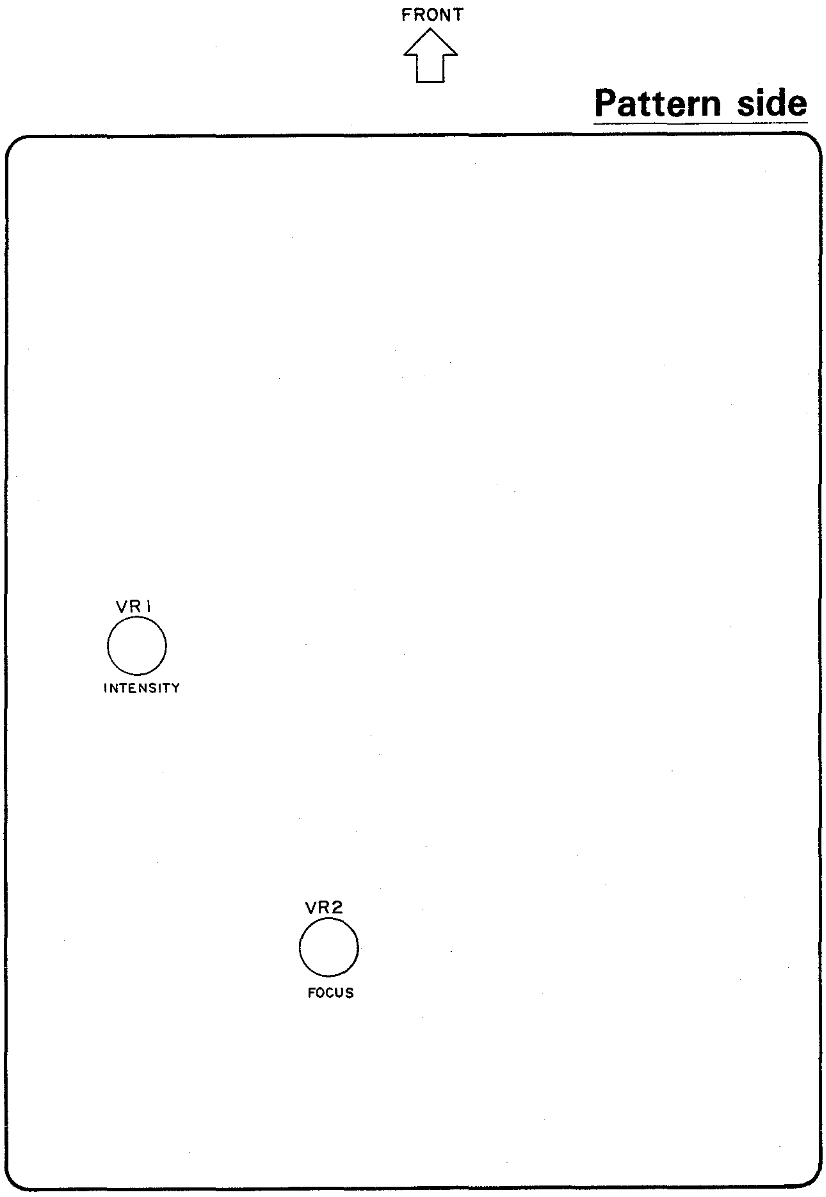
ADJUSTMENT

POWER SUPPLY UNIT (X68-1500-01)


P17
VR1
-10V Adj.
FRONT

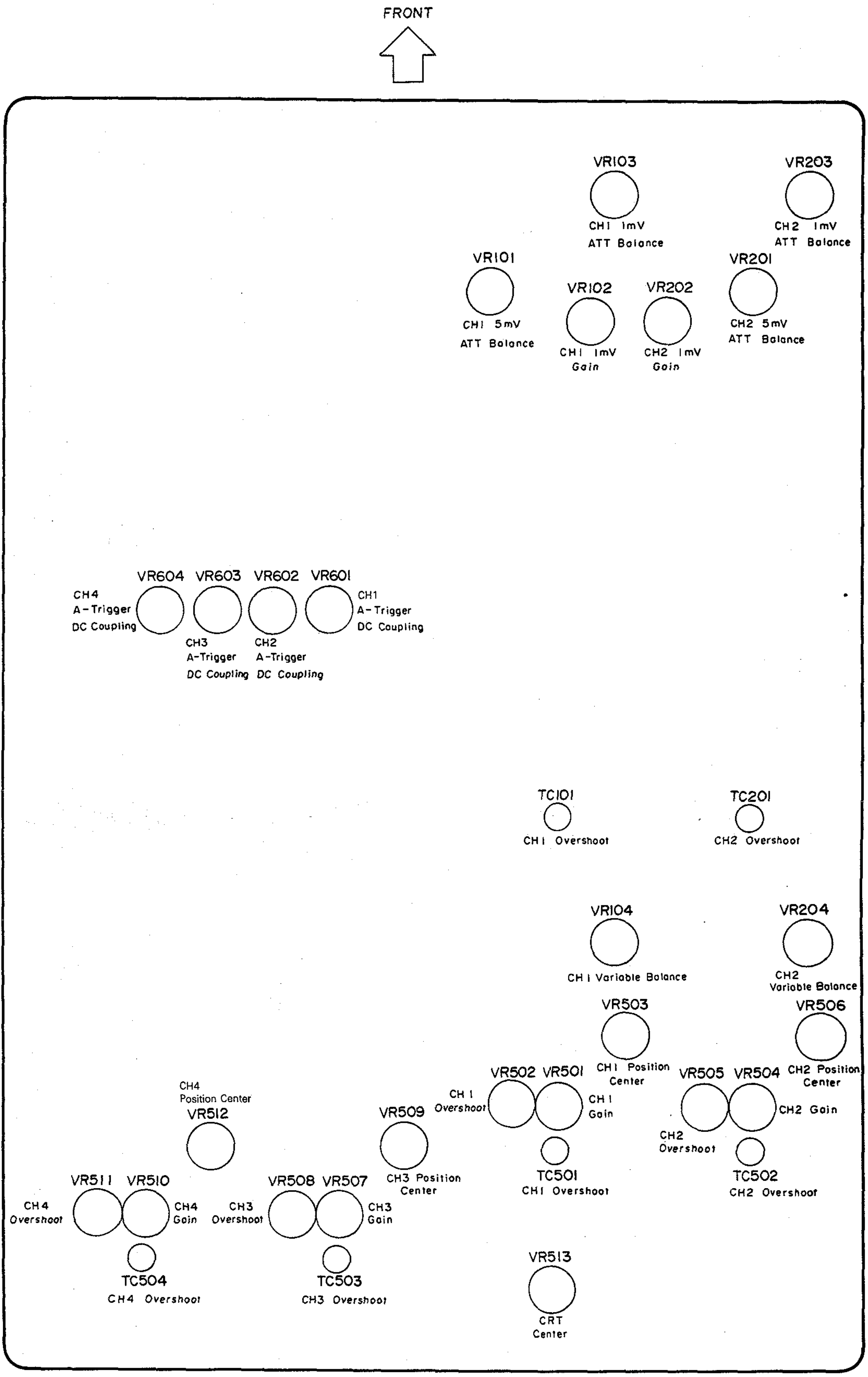
ADJUSTMENT

HIGH VOLTAGE UNIT (X68-1510-03)


FRONT
Pattern side
VR1
INTENSITY
VR2
FOCUS

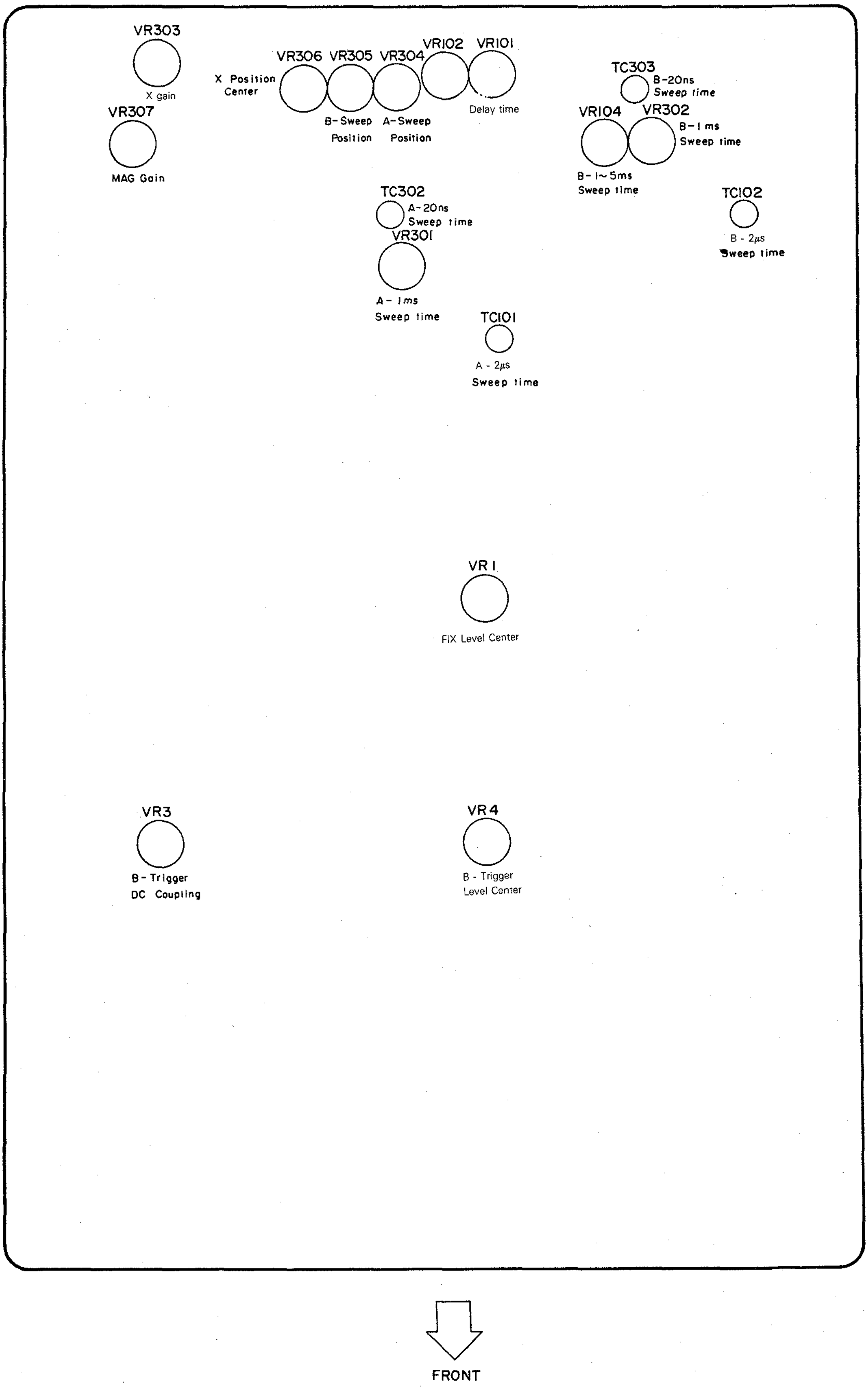
ADJUSTMENT

VERTICAL PRE AMPLIFIER UNIT (X73-1760-01)


FRONT
VR103
CH1 1mV
ATT Balance
VR203
CH2 1mV
ATT Balance
VR101
CH1 5mV
ATT Balance
VR102
CH1 1mV
Gain
VR202
CH2 1mV
Gain
VR201
CH2 5mV
ATT Balance
VR604
CH4
A-Trigger
DC Coupling
VR603
CH3
A-Trigger
DC Coupling
VR602
CH2
A-Trigger
DC Coupling
VR601
CH1
A-Trigger
DC Coupling
TC101
CH1 Overshoot
TC201
CH2 Overshoot
VR104
CH1 Variable Balance
VR204
CH2
Variable Balance
VR503
CH1 Position
Center
VR506
CH2 Position
Center
VR502
CH1
Overshoot
VR501
CH1
Gain
TC501
CH1 Overshoot
VR505
CH2
Overshoot
VR504
CH2 Gain
TC502
CH2 Overshoot
CH4
Position Center
VR512
VR509
CH3 Position
Center
VR511
CH4
Overshoot
VR510
CH4
Gain
TC504
CH4 Overshoot
VR508
CH3
Overshoot
VR507
CH3
Gain
TC503
CH3 Overshoot
VR513
CRT
Center

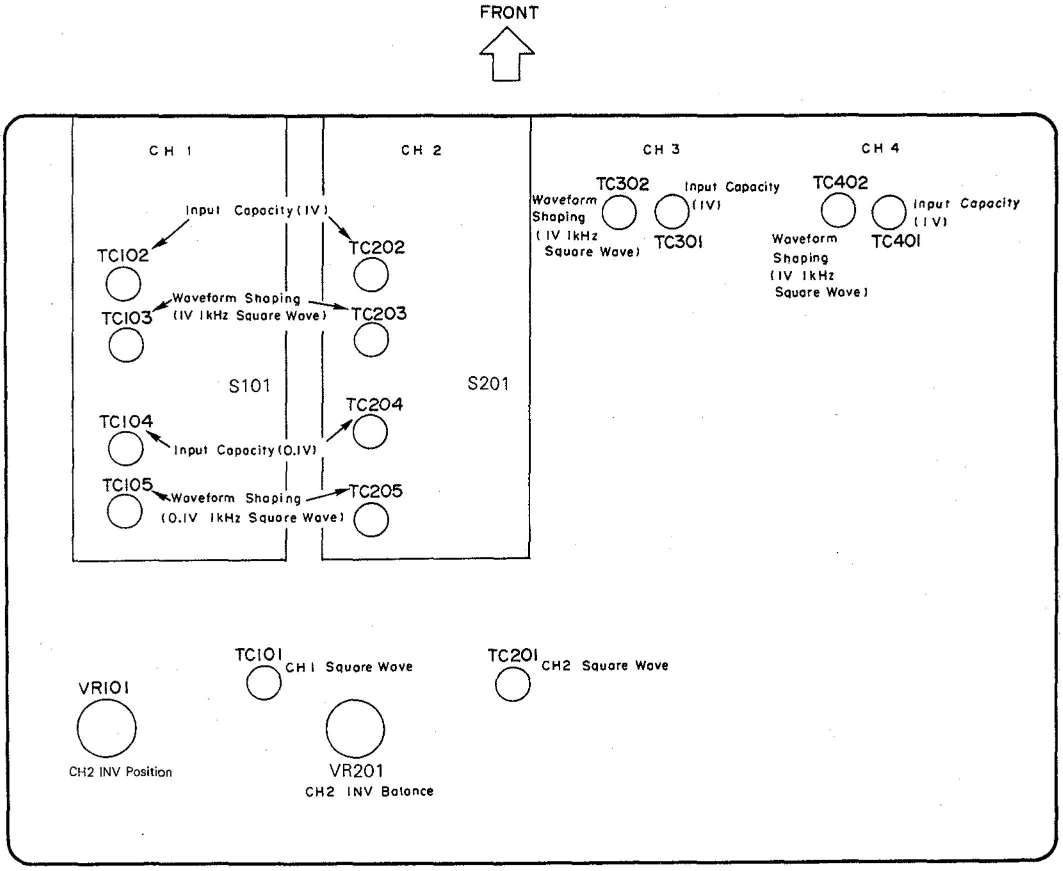
ADJUSTMENT

HORIZONTAL UNIT (X74-1480-03)

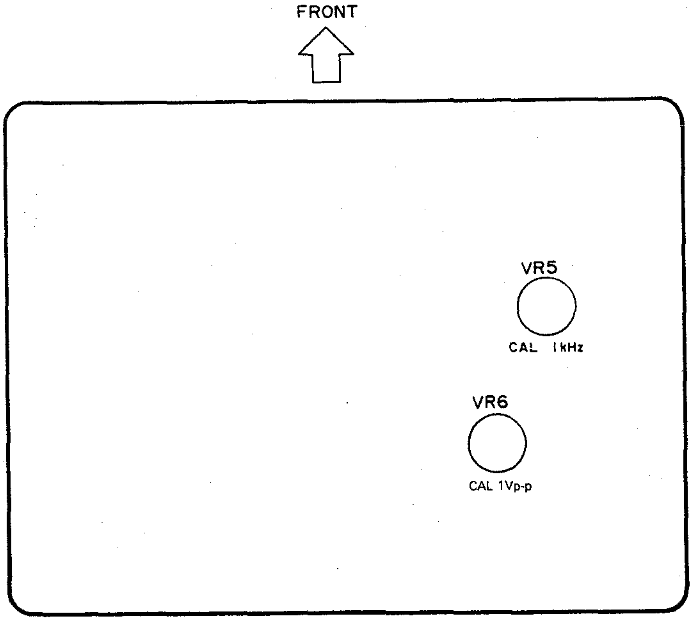

VR303
X gain
VR307
MAG Gain
VR306 VR305 VR304
X Position Center
B-Sweep Position
A-Sweep Position
VR102 VR101
Delay time
TC303
B-20ns Sweep time
VR104 VR302
B-1 ms Sweep time
B-1~5ms Sweep time
TC102
B - 2μs Sweep time
TC302
A-20ns Sweep time
VR301
A-1ms Sweep time
TC101
A - 2μs Sweep time
VR1
FIX Level Center
VR3
B-Trigger DC Coupling
VR4
B - Trigger Level Center
FRONT

ADJUSTMENT

ATT UNIT (X75-1180-01)

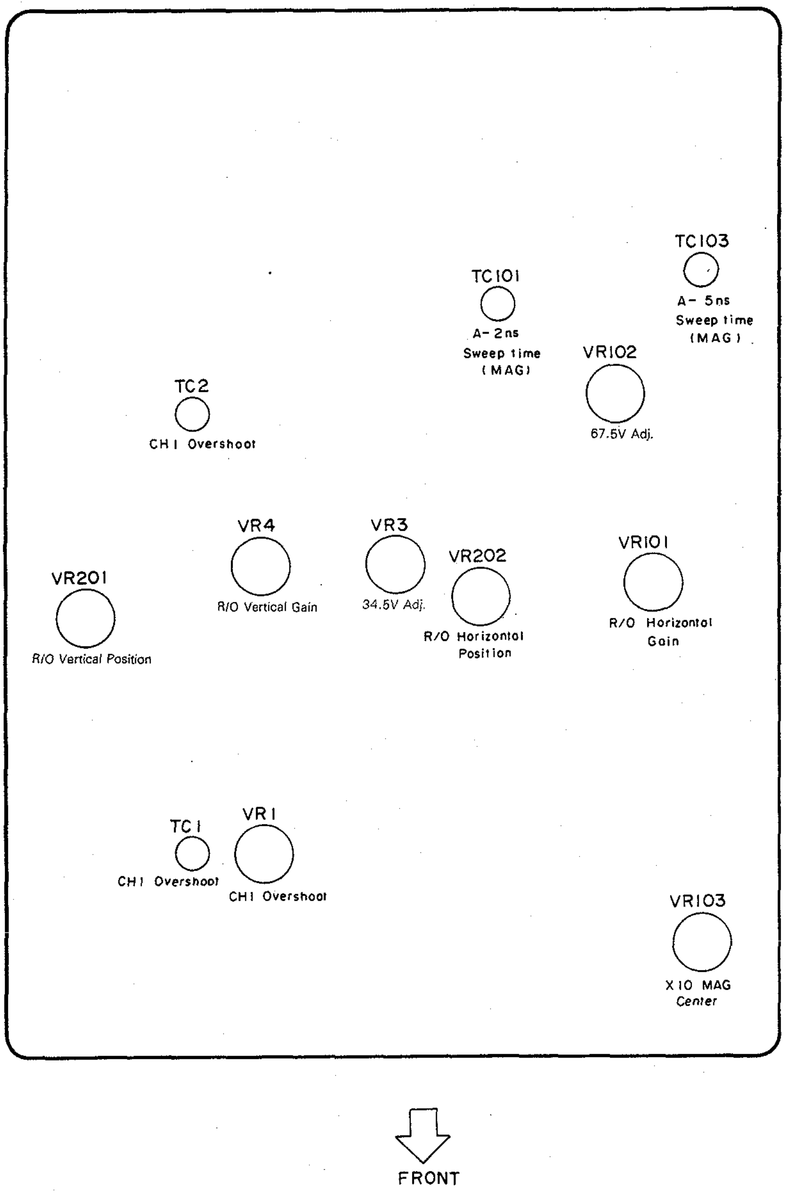

FRONT
CH 1
CH 2
CH 3
CH 4
Input Capacity (1V)
TC102
TC202
Waveform Shaping (1V 1kHz Square Wave)
TC103
TC203
S101
S201
TC104
TC204
Input Capacity (0.1V)
TC105
Waveform Shaping (0.1V 1kHz Square Wave)
TC205
TC302
Waveform Shaping (1V 1kHz Square Wave)
Input Capacity (1V)
TC301
TC402
Input Capacity (1V)
Waveform Shaping (1V 1kHz Square Wave)
TC401
TC101
CH 1 Square Wave
TC201
CH2 Square Wave
VR101
CH2 INV Position
VR201
CH2 INV Balance

VOLUME UNIT (X81-2330-03)

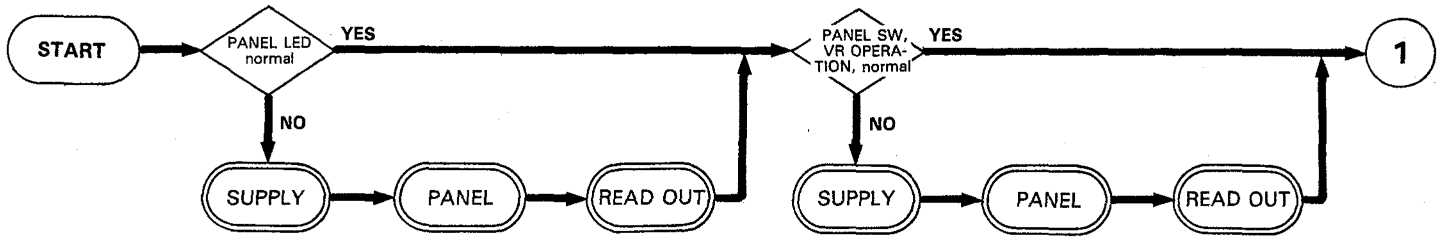

FRONT
VR5
CAL 1kHz
VR6
CAL 1Vp-p

ADJUSTMENT

FINAL AMP UNIT (X80-1100-03)


TC103
A- 5ns
Sweep time
(MAG)
TC101
A- 2ns
Sweep time
(MAG)
VR102
67.5V Adj.
TC2
CH1 Overshoot
VR4
R/O Vertical Gain
VR3
34.5V Adj.
VR202
R/O Horizontal
Position
VR101
R/O Horizontal
Gain
VR201
R/O Vertical Position
TC1
CH1 Overshoot
VR1
CH1 Overshoot
VR103
X10 MAG
Center
FRONT

TROUBLESHOOTING


START
PANEL LED normal
YES
NO
SUPPLY
PANEL
READ OUT
PANEL SW, VR OPERATION, normal
YES
NO
SUPPLY
PANEL
READ OUT
1

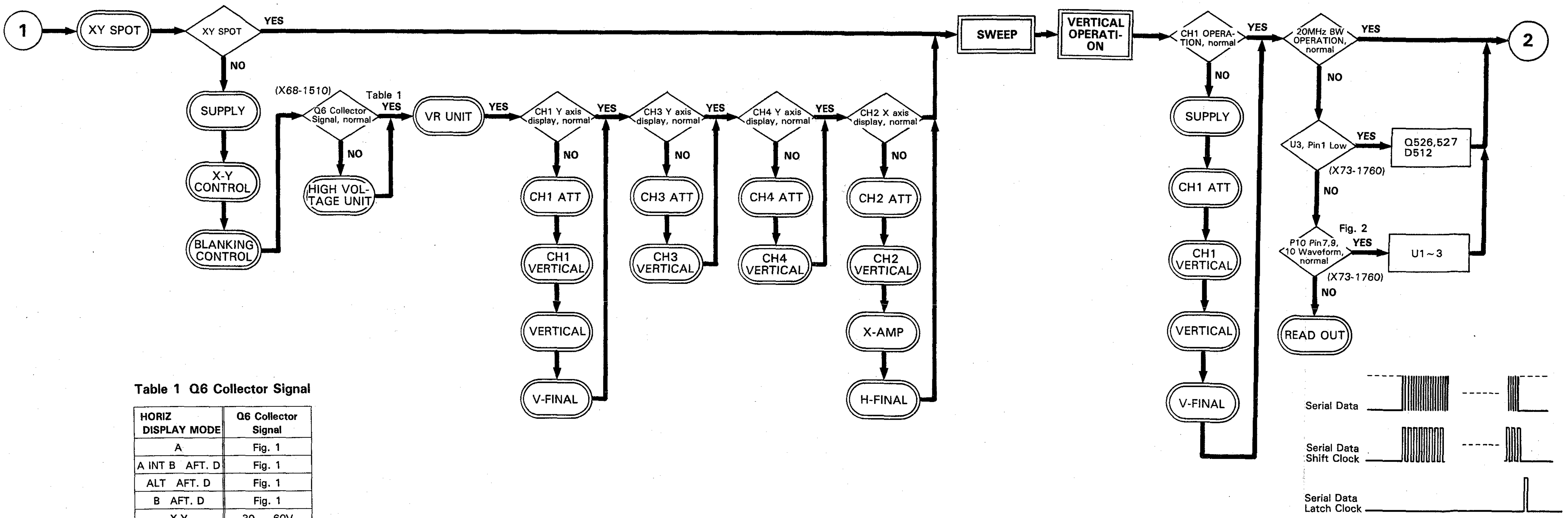

1
XY SPOT
XY SPOT
YES
NO
SUPPLY
X-Y CONTROL
BLANKING CONTROL
(X68-1510)
Table 1
Q6 Collector Signal, normal
YES
NO
HIGH VOLTAGE UNIT
VR UNIT
YES
CH1 Y axis display, normal
YES
NO
CH1 ATT
CH1 VERTICAL
VERTICAL
V-FINAL
CH3 Y axis display, normal
YES
NO
CH3 ATT
CH3 VERTICAL
CH4 Y axis display, normal
YES
NO
CH4 ATT
CH4 VERTICAL
CH2 X axis display, normal
NO
CH2 ATT
CH2 VERTICAL
X-AMP
H-FINAL
SWEEP
VERTICAL OPERATION
CH1 OPERATION, normal
YES
NO
SUPPLY
CH1 ATT
CH1 VERTICAL
VERTICAL
V-FINAL
20MHz BW OPERATION, normal
YES
NO
U3, Pin1 Low
YES
Q526,527
D512
(X73-1760)
NO
Fig. 2
P10 Pin7,9, 10 Waveform, normal
YES
U1~3
(X73-1760)
NO
READ OUT
2
Serial Data
Serial Data Shift Clock
Serial Data Latch Clock

Table 1 Q6 Collector Signal

HORIZ DISPLAY MODE	Q6 Collector Signal
A	Fig. 1
A INT B AFT. D	Fig. 1
ALT AFT. D	Fig. 1
B AFT. D	Fig. 1
X-Y	30 ~ 60V

Fig. 2 Serial transmit timing chart

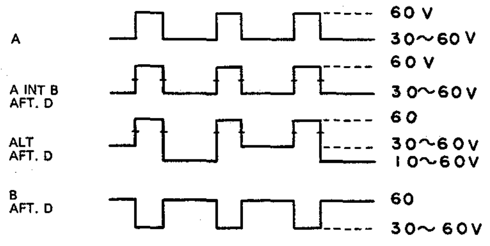
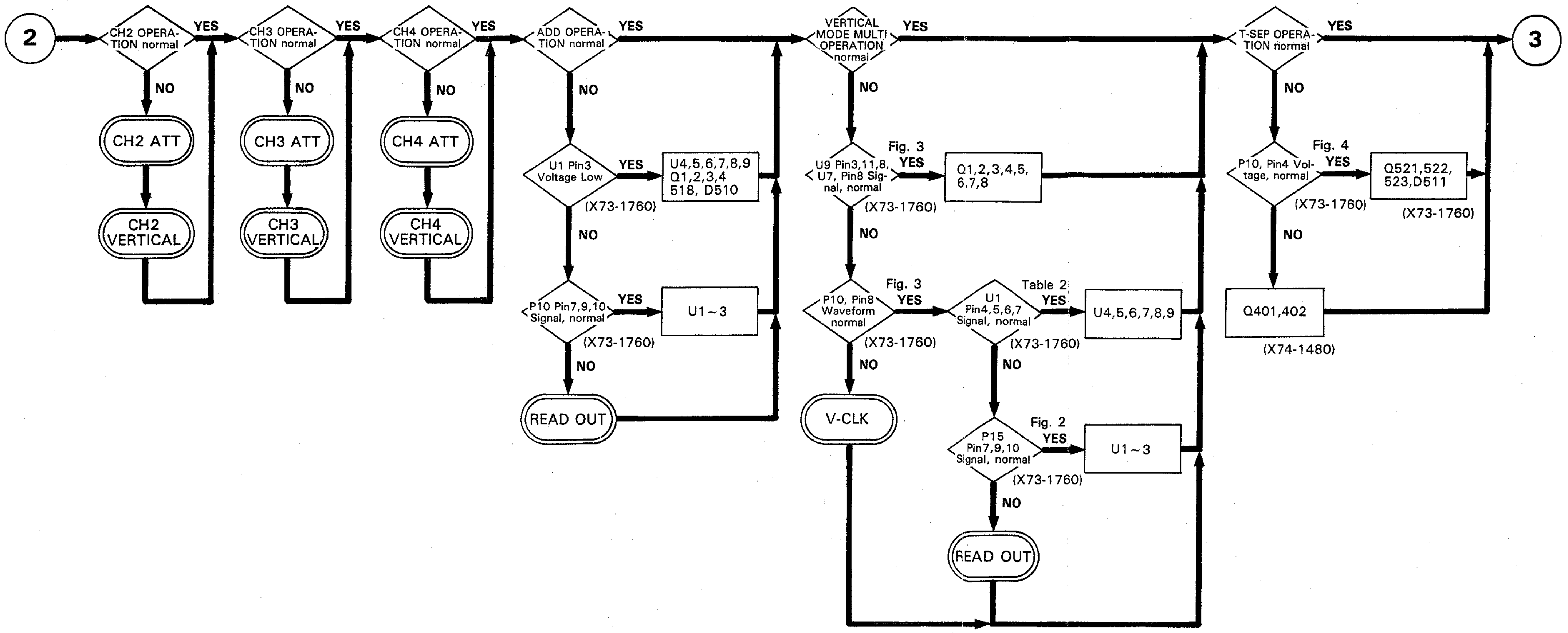
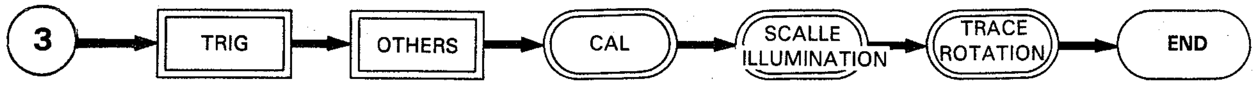


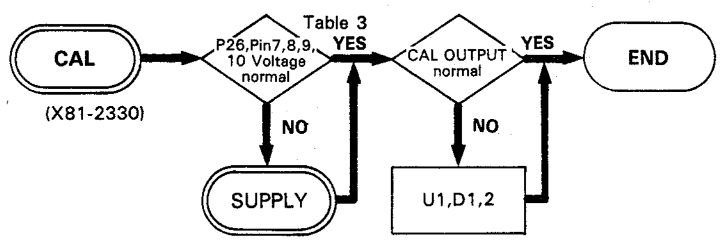
Fig. 1 Q6 Collector Signal

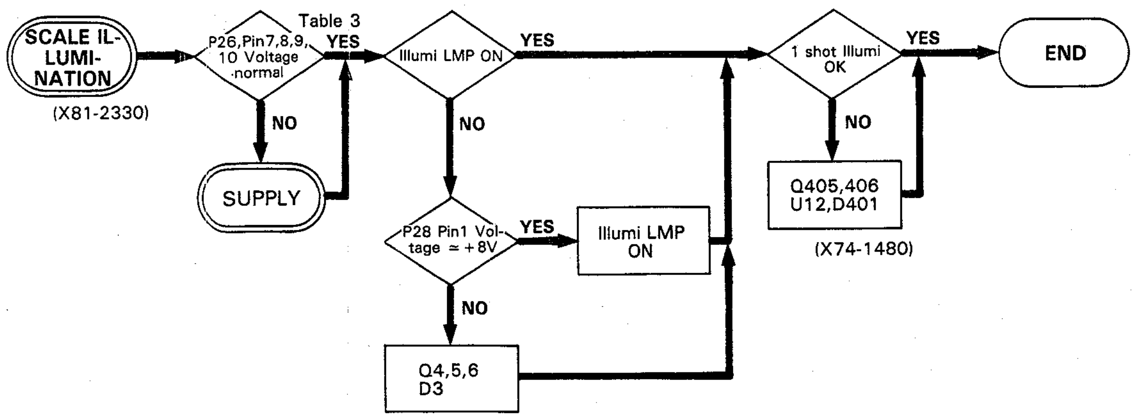
	Panel SW SCAN	Panel LED Control	ATT UNIT Control	V UNIT Control	H UNIT Control
Serial Data	P1 Pin 4 (SD)	P1 Pin 1 (LD)	P4 Pin 9 (AD)	U16 Pin 16 (VD)	U16 Pin 19 (HD)
Serial Data Shift Clock	P1 Pin 5 (SSC)	P1 Pin 2 (LSC)	P4 Pin 8 (ASC)	U9 Pin 14 (VSC)	U9 Pin 10 (HSC)
Serial Data Latch Clock	P1 Pin 6 (SLC)	P1 Pin 3 (LLC)	P4 Pin 7 (ALC)	U8 Pin 11 (VLC)	U8 Pin 7 (HLC)

TROUBLESHOOTING

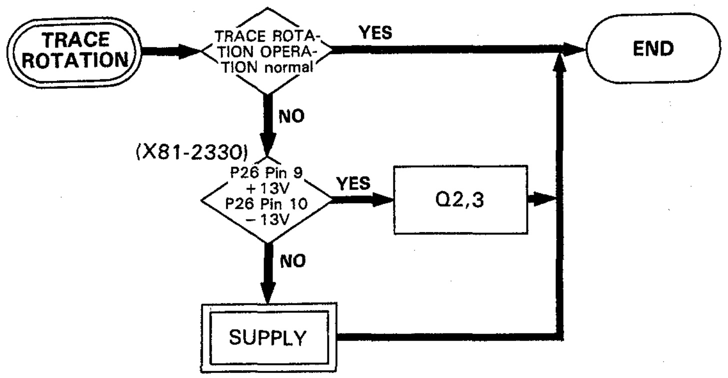

2
CH2 OPERA-TION normal
YES
NO
CH2 ATT
CH2 VERTICAL
CH3 OPERA-TION normal
YES
NO
CH3 ATT
CH3 VERTICAL
CH4 OPERA-TION normal
YES
NO
CH4 ATT
CH4 VERTICAL
ADD OPERA-TION normal
YES
NO
U1 Pin3 Voltage Low
YES
U4,5,6,7,8,9 Q1,2,3,4 518, D510
(X73-1760)
NO
P10 Pin7,9,10 Signal, normal
YES
U1~3
(X73-1760)
NO
READ OUT
VERTICAL MODE MULTI OPERATION normal
YES
NO
Fig. 3
U9 Pin3,11,8, U7, Pin8 Signal, normal
YES
Q1,2,3,4,5, 6,7,8
(X73-1760)
NO
Fig. 3
P10, Pin8 Waveform normal
YES
(X73-1760)
NO
V-CLK
Table 2
U1 Pin4,5,6,7 Signal, normal
YES
U4,5,6,7,8,9
(X73-1760)
NO
Fig. 2
P15 Pin7,9,10 Signal, normal
YES
U1~3
(X73-1760)
NO
READ OUT
T-SEP OPERA-TION normal
YES
NO
Fig. 4
P10, Pin4 Voltage, normal
YES
Q521,522, 523,D511
(X73-1760)
(X73-1760)
NO
Q401,402
(X74-1480)
3

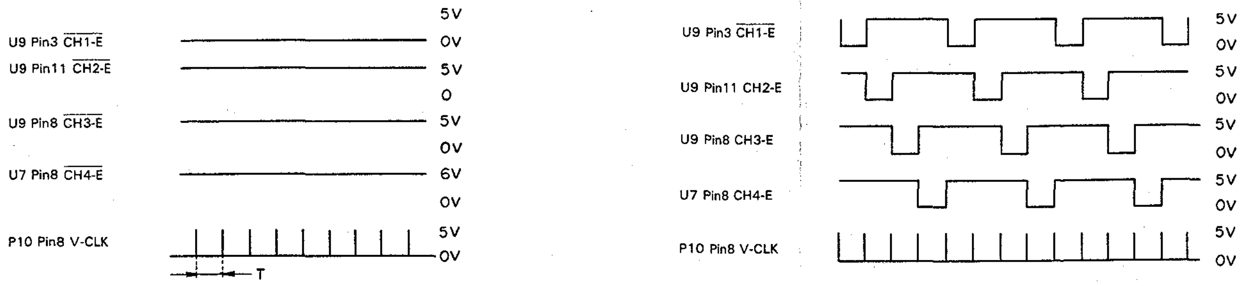

3
TRIG
OTHERS
CAL
SCALLE ILLUMINATION
TRACE ROTATION
END


CAL
(X81-2330)
Table 3
P26,Pin7,8,9, 10 Voltage normal
YES
NO
SUPPLY
CAL OUTPUT normal
YES
NO
U1,D1,2
END


SCALE IL-LUMI-NATION
(X81-2330)
Table 3
P26,Pin7,8,9, 10 Voltage normal
YES
NO
SUPPLY
Illumi LMP ON
YES
NO
P28 Pin1 Voltage ≈ +8V
YES
Illumi LMP ON
NO
Q4,5,6 D3
1 shot Illumi OK
YES
NO
Q405,406 U12,D401
(X74-1480)
END

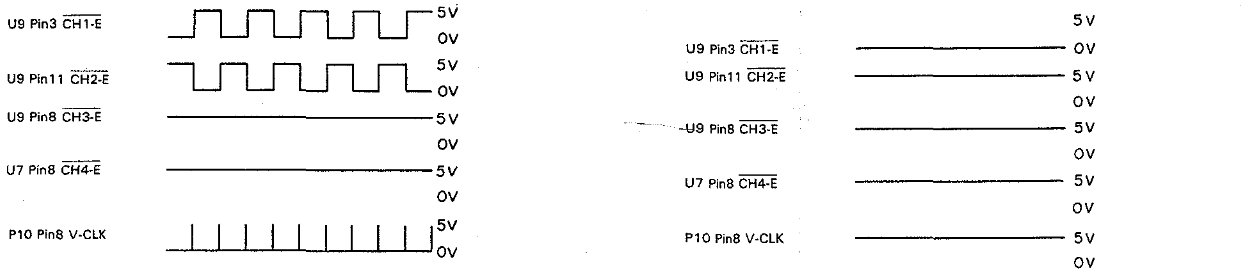
TROUBLESHOOTING


TRACE ROTATION
TRACE ROTATION OPERATION normal
YES
END
NO
(X81-2330)
P26 Pin 9 +13V P26 Pin 10 −13V
YES
Q2,3
NO
SUPPLY


U9 Pin3 CH1-E
U9 Pin11 CH2-E
U9 Pin8 CH3-E
U7 Pin8 CH4-E
P10 Pin8 V-CLK
5V
0V
5V
0
5V
0V
6V
0V
5V
0V
T
U9 Pin3 CH1-E
U9 Pin11 CH2-E
U9 Pin8 CH3-E
U7 Pin8 CH4-E
P10 Pin8 V-CLK
5V
0V
5V
0V
5V
0V
5V
0V
5V
0V

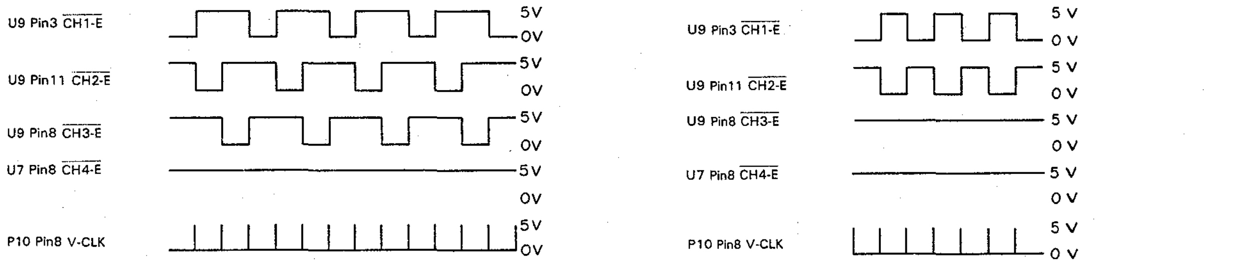
(a) CH1 SELECT

(d) CH1, CH2, CH3, CH4 SELECT


U9 Pin3 CH1-E
U9 Pin11 CH2-E
U9 Pin8 CH3-E
U7 Pin8 CH4-E
P10 Pin8 V-CLK
5V
0V
5V
0V
5V
0V
5V
0V
5V
0V
U9 Pin3 CH1-E
U9 Pin11 CH2-E
U9 Pin8 CH3-E
U7 Pin8 CH4-E
P10 Pin8 V-CLK
5V
0V
5V
0V
5V
0V
5V
0V
5V
0V

(b) CH1, CH2 SELECT

(e) X-Y CH1 SELECT


U9 Pin3 CH1-E
U9 Pin11 CH2-E
U9 Pin8 CH3-E
U7 Pin8 CH4-E
P10 Pin8 V-CLK
5V
0V
5V
0V
5V
0V
5V
0V
5V
0V
U9 Pin3 CH1-E
U9 Pin11 CH2-E
U9 Pin8 CH3-E
U7 Pin8 CH4-E
P10 Pin8 V-CLK
5 V
0 V
5 V
0 V
5 V
0 V
5 V
0 V
5 V
0 V

(c) CH1, CH2, CH3 SELECT

(f) X-Y CH1, CH2 SELECT

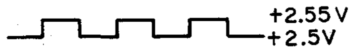
Fig. 3 VERTICAL CH SELECT WAVEFORM

T: H-MODE A, A INT B, B, X-Y
42 µs: 24kHz

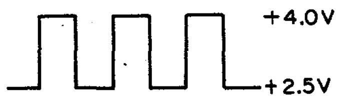
T: H-MODE ALT
84 µs: 12kHz

Table 2 U1, CH SELECT Voltage

CH SELECT	U1				
	Pin3	Pin4	Pin5	Pin6	Pin7
CH1					L
CH2				L	
CH3			L		
CH4		L			
ADD	LOW				



(a) FULLY CW



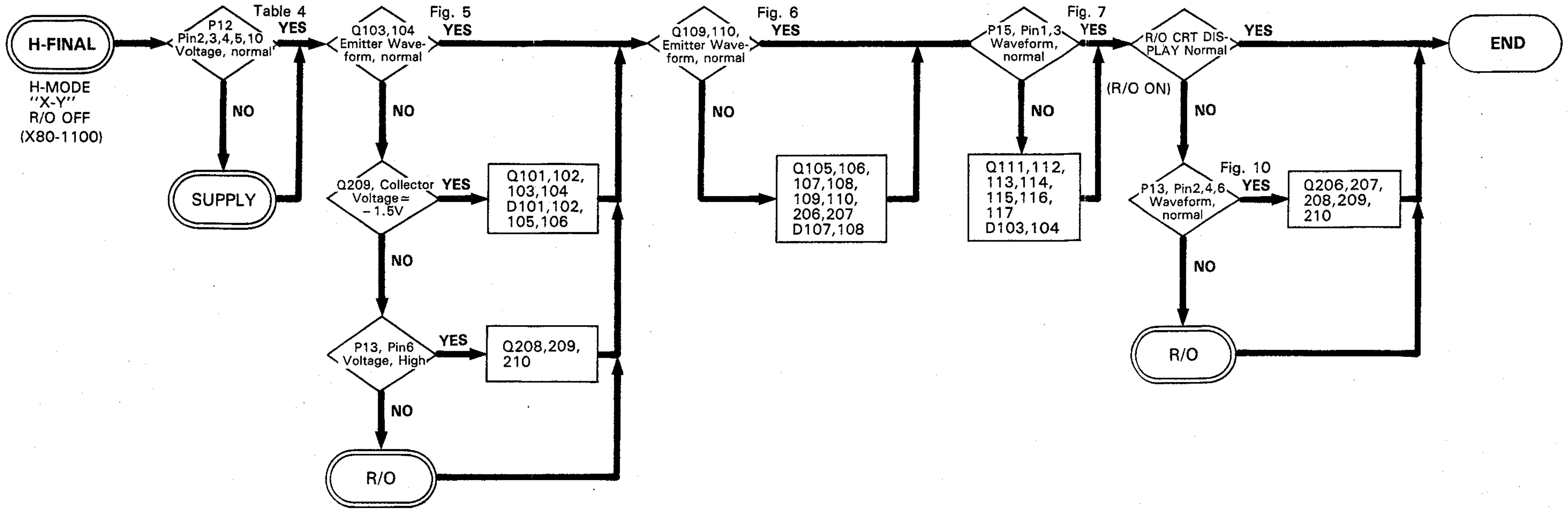
(b) FULLY CCW

Fig. 4 P10, Pin4 Waveform

Table 3 Voltage

P26 Pin No.	Voltage [V]
7	+10
8	−10
9	+13
10	−13

TROUBLESHOOTING


H-FINAL
H-MODE
"X-Y"
R/O OFF
(X80-1100)
Table 4
P12 Pin2,3,4,5,10 Voltage, normal
YES
NO
SUPPLY
Fig. 5
Q103,104 Emitter Waveform, normal
YES
NO
Q209, Collector Voltage≈ −1.5V
YES
Q101,102, 103,104 D101,102, 105,106
NO
P13, Pin6 Voltage, High
YES
Q208,209, 210
NO
R/O
Fig. 6
Q109,110, Emitter Waveform, normal
YES
NO
Q105,106, 107,108, 109,110, 206,207 D107,108
Fig. 7
P15, Pin1,3, Waveform, normal
YES
NO
Q111,112, 113,114, 115,116, 117 D103,104
(R/O ON)
R/O CRT DISPLAY Normal
YES
NO
Fig. 10
P13, Pin2,4,6 Waveform, normal
YES
Q206,207, 208,209, 210
NO
R/O
END

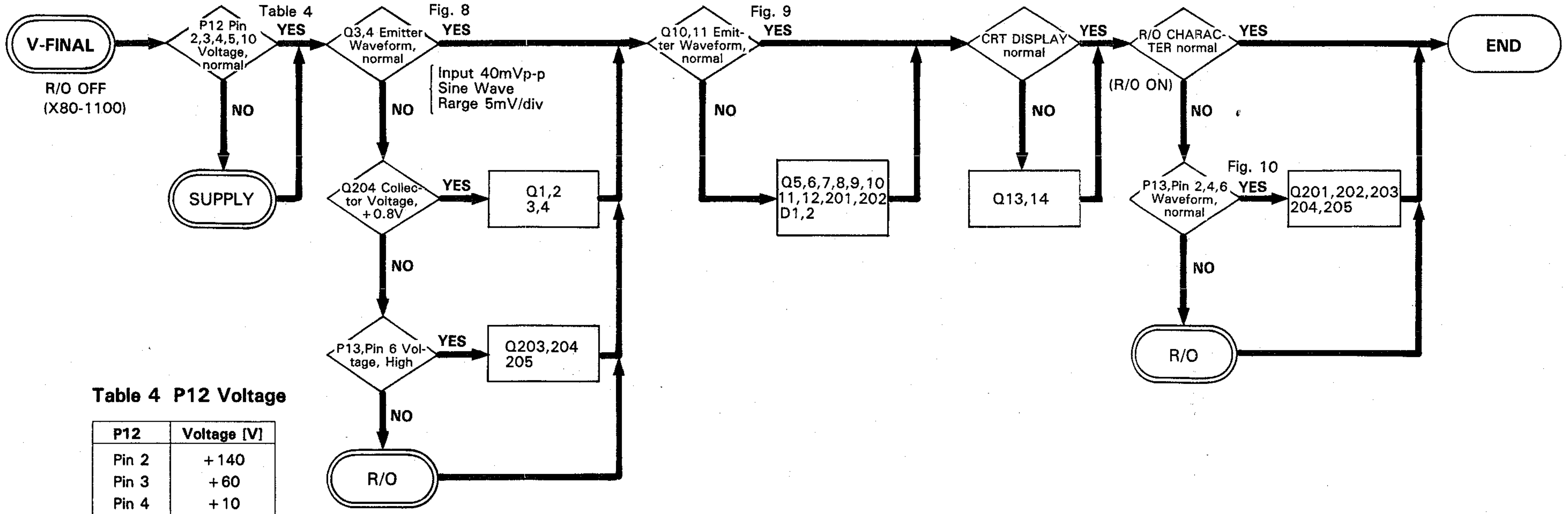

V-FINAL
R/O OFF
(X80-1100)
Table 4
P12 Pin 2,3,4,5,10 Voltage, normal
YES
NO
SUPPLY
Fig. 8
Q3,4 Emitter Waveform, normal
YES
Input 40mVp-p
Sine Wave
Rarge 5mV/div
NO
Q204 Collector Voltage, +0.8V
YES
Q1,2 3,4
NO
P13,Pin 6 Voltage, High
YES
Q203,204 205
NO
R/O
Fig. 9
Q10,11 Emitter Waveform, normal
YES
NO
Q5,6,7,8,9,10 11,12,201,202 D1,2
CRT DISPLAY normal
YES
NO
Q13,14
(R/O ON)
R/O CHARACTER normal
YES
NO
Fig. 10
P13,Pin 2,4,6 Waveform, normal
YES
Q201,202,203 204,205
NO
R/O
END

Table 4 P12 Voltage

P12	Voltage [V]
Pin 2	+140
Pin 3	+60
Pin 4	+10
Pin 5	−10
Pin10	+15

TROUBLESHOOTING

H-MODE "X-Y"
CH2 Input: 40mVp-p 1kHz Sine Ware
Volts/div: 5mV/div

Input: 40mVp-p, 1 kHz
Sine Wave
Volts/div: 5mV/div

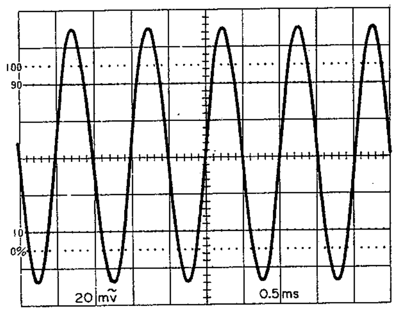


Fig. 5 DC −0.3V

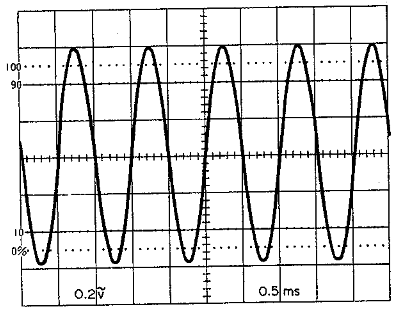


Fig. 6 DC −4V

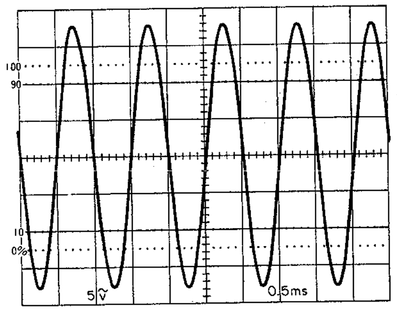
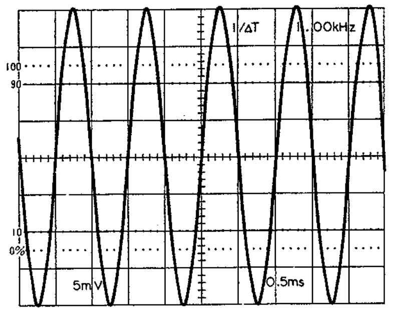


Fig. 7 DC +70V



CRT

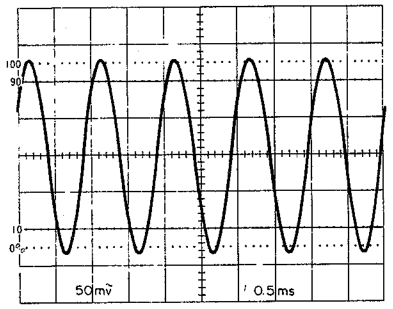


Fig. 8 DC +2.6V

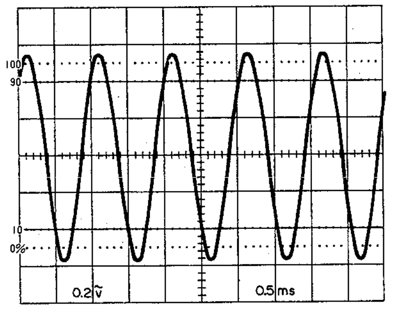
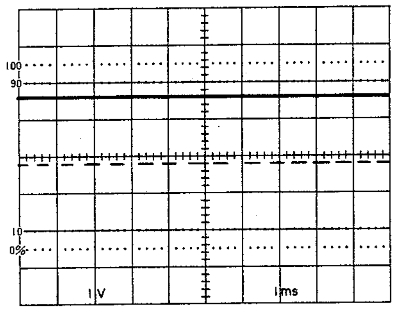
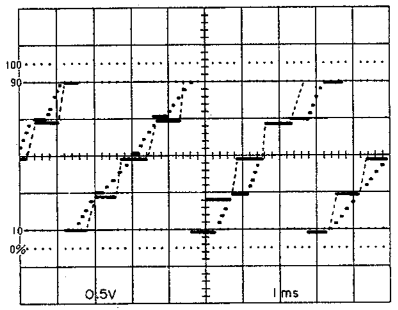


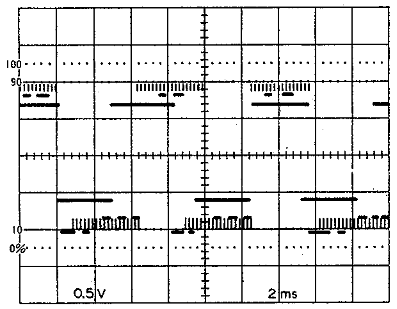
Fig. 9 DC +3.7V



Pin 6



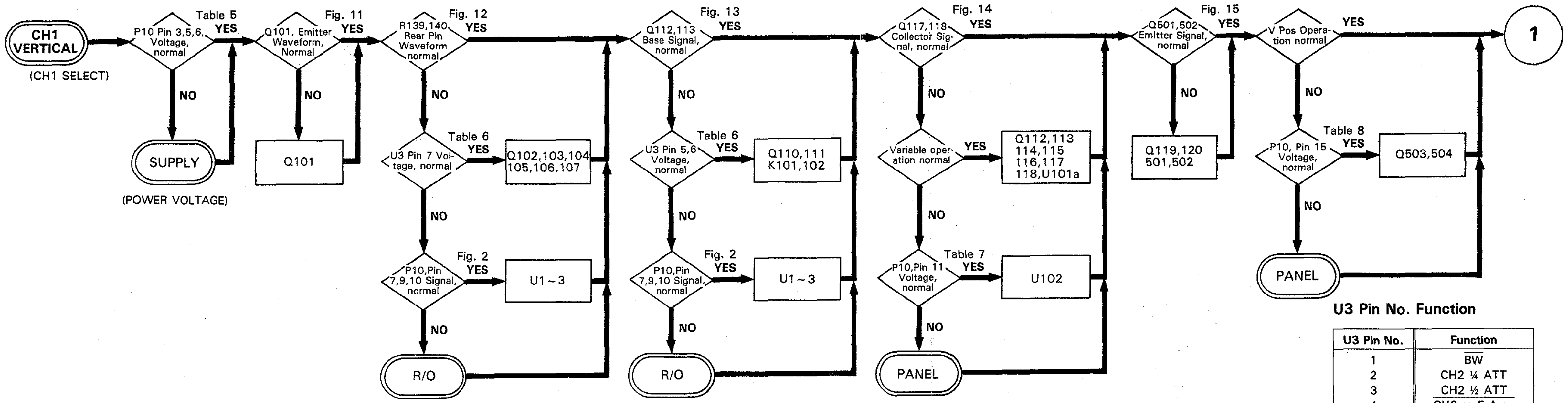
Pin 4



Pin 2

Fig. 10 P13. R/O Signal (R/O ON)

TROUBLESHOOTING


CH1 VERTICAL
(CH1 SELECT)
P10 Pin 3,5,6, Voltage, normal
Table 5
YES
NO
SUPPLY
(POWER VOLTAGE)
Q101, Emitter Waveform, Normal
Fig. 11
YES
NO
Q101
R139,140 Rear Pin Waveform normal
Fig. 12
YES
NO
U3 Pin 7 Voltage, normal
Table 6
YES
Q102,103,104 105,106,107
NO
P10,Pin 7,9,10 Signal, normal
Fig. 2
YES
U1~3
NO
R/O
Q112,113 Base Signal, normal
Fig. 13
YES
NO
U3 Pin 5,6 Voltage, normal
Table 6
YES
Q110,111 K101,102
NO
P10,Pin 7,9,10 Signal, normal
Fig. 2
YES
U1~3
NO
R/O
Q117,118 Collector Signal, normal
Fig. 14
YES
NO
Variable operation normal
YES
Q112,113 114,115 116,117 118,U101a
NO
P10,Pin 11 Voltage, normal
Table 7
YES
U102
NO
PANEL
Q501,502 Emitter Signal, normal
Fig. 15
YES
NO
Q119,120 501,502
V Pos Operation normal
YES
1
NO
P10, Pin 15 Voltage, normal
Table 8
YES
Q503,504
NO
PANEL

U3 Pin No. Function

U3 Pin No.	Function
1	BW
2	CH2 ¼ ATT
3	CH2 ½ ATT
4	CH2 × 5 Amp
5	CH1 ¼ ATT
6	CH1 ½ ATT
7	CH1 × 5 Amp
15	――――

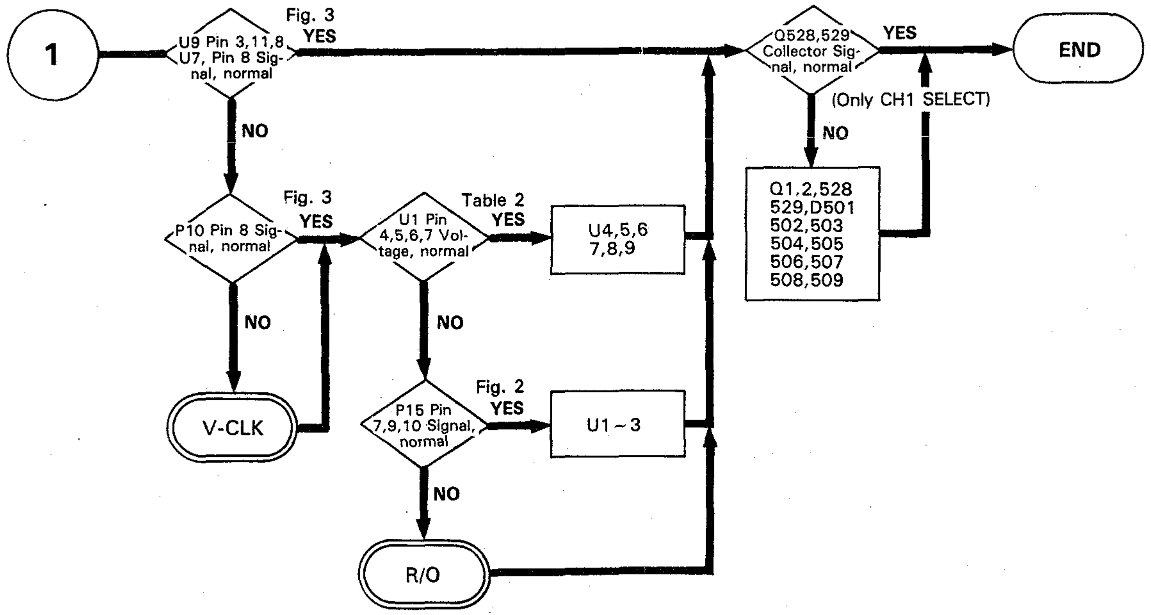

1
U9 Pin 3,11,8 U7, Pin 8 Signal, normal
Fig. 3
YES
NO
P10 Pin 8 Signal, normal
Fig. 3
YES
NO
V-CLK
U1 Pin 4,5,6,7 Voltage, normal
Table 2
YES
U4,5,6 7,8,9
NO
P15 Pin 7,9,10 Signal, normal
Fig. 2
YES
U1~3
NO
R/O
Q528,529 Collector Signal, normal
YES
END
(Only CH1 SELECT)
NO
Q1,2,528 529,D501 502,503 504,505 506,507 508,509

Table 5 Vpre Power Voltage

P10	Voltage [V]
Pin3	+10
Pin5	+ 5
Pin6	−10

Table 6 U3 Pin Voltage

Volts/div	CH2			CH1		
	Pin2	Pin3	Pin4	Pin5	Pin6	Pin7
1 mV						
2		H			H	
5			H			H
10		H	H		H	H
20	H	H	H	H	H	H
50			H			H
0.1 V		H	H		H	H
0.2	H	H	H	H	H	H
0.5			H			H
1.0		H	H		H	H
2.0	H	H	H	H	H	H
5.0			H			H

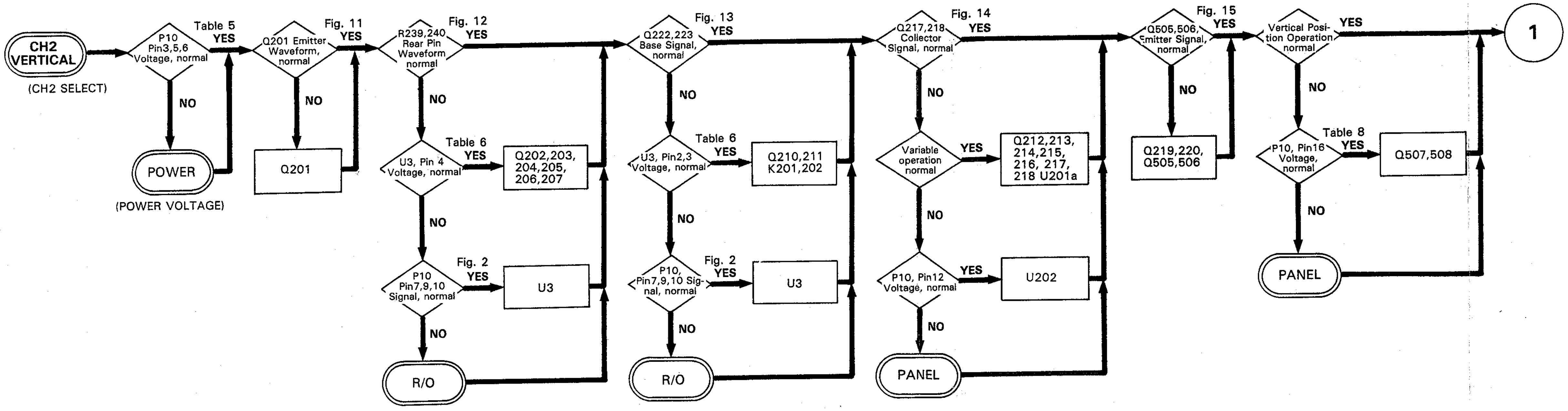
Table 7 P10 CAL~UNCAL

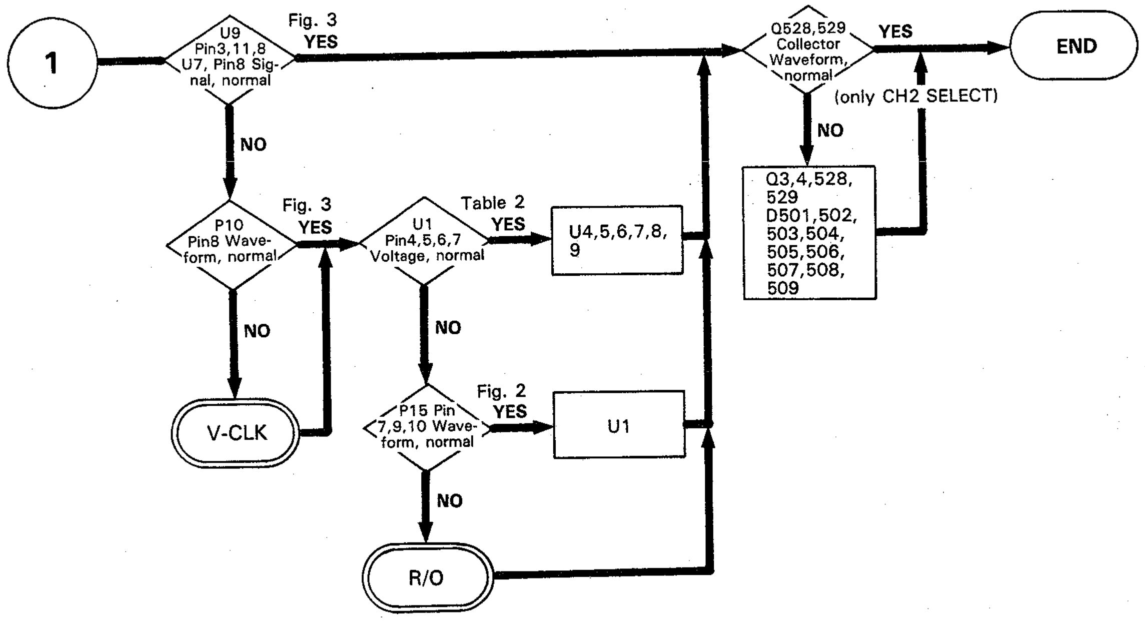
P10	CAL ~ UNCAL
Pin11	0 ~ +10V
Pin12	0 ~ +10V

Table 8 P10 POS VR

P10	Pos VR Fully CW ~ Fully CCW
Pin15	−10V ~ +10V
Pin16	−10V ~ +10V
Pin13	−10V ~ +10V
Pin14	−10V ~ +10V

TROUBLESHOOTING


CH2 VERTICAL
(CH2 SELECT)
P10 Pin3,5,6 Voltage, normal
Table 5
YES
NO
POWER
(POWER VOLTAGE)
Q201 Emitter Waveform, normal
Fig. 11
YES
NO
Q201
R239,240 Rear Pin Waveform normal
Fig. 12
YES
NO
U3, Pin 4 Voltage, normal
Table 6
YES
Q202,203, 204,205, 206,207
NO
P10 Pin7,9,10 Signal, normal
Fig. 2
YES
U3
NO
R/O
Q222,223 Base Signal, normal
Fig. 13
YES
NO
U3, Pin2,3 Voltage, normal
Table 6
YES
Q210,211 K201,202
NO
P10, Pin7,9,10 Signal, normal
Fig. 2
YES
U3
NO
R/O
Q217,218 Collector Signal, normal
Fig. 14
YES
NO
Variable operation normal
YES
Q212,213, 214,215, 216, 217, 218 U201a
NO
P10, Pin12 Voltage, normal
YES
U202
NO
PANEL
Q505,506, Emitter Signal, normal
Fig. 15
YES
NO
Q219,220, Q505,506
Vertical Position Operation normal
YES
NO
P10, Pin16 Voltage, normal
Table 8
YES
Q507,508
NO
PANEL
1


1
U9 Pin3,11,8 U7, Pin8 Signal, normal
Fig. 3
YES
NO
P10 Pin8 Waveform, normal
Fig. 3
YES
NO
V-CLK
U1 Pin4,5,6,7 Voltage, normal
Table 2
YES
U4,5,6,7,8, 9
NO
P15 Pin 7,9,10 Waveform, normal
Fig. 2
YES
U1
NO
R/O
Q528,529 Collector Waveform, normal
YES
END
(only CH2 SELECT)
NO
Q3,4,528, 529 D501,502, 503,504, 505,506, 507,508, 509

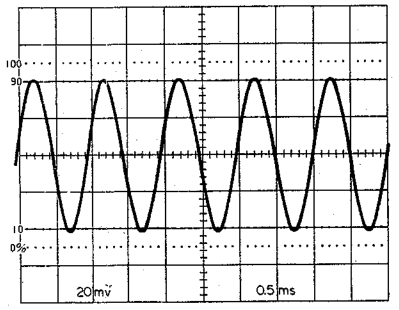


Fig. 11 DC +6V

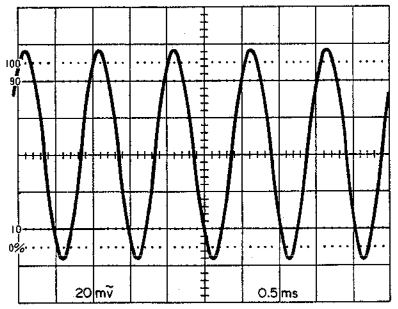


Fig. 12 DC −1.8V

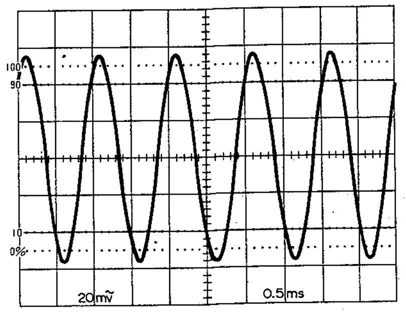


Fig. 13 DC −1.8V

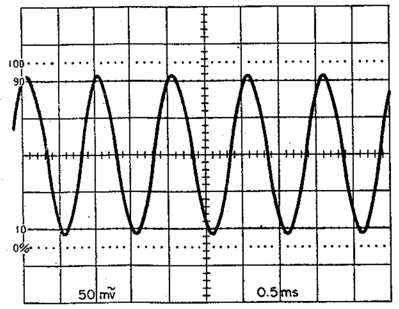


Fig. 14 DC +4.8V

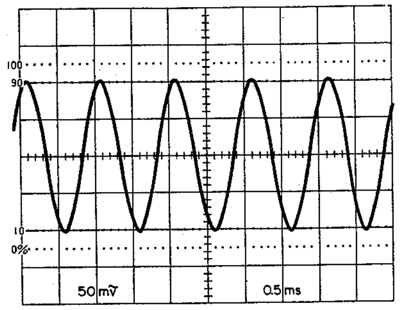
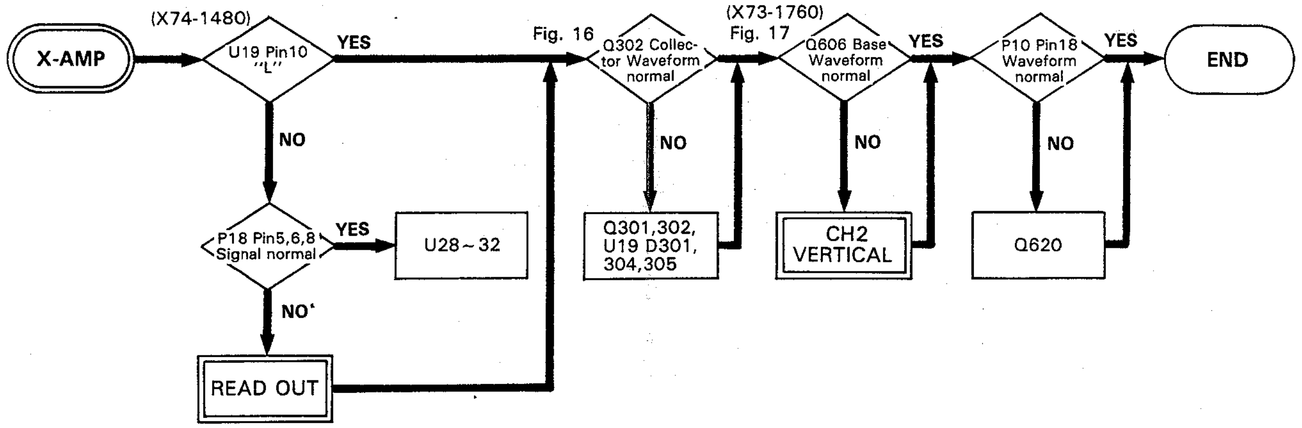


Fig. 15 DC +4.8V

TROUBLESHOOTING


X-AMP
(X74-1480)
U19 Pin10 "L"
YES
NO
P18 Pin5,6,8 Signal normal
YES
U28~32
NO
READ OUT
Fig. 16
Q302 Collector Waveform normal
NO
Q301,302, U19 D301, 304,305
(X73-1760)
Fig. 17
Q606 Base Waveform normal
YES
NO
CH2 VERTICAL
P10 Pin18 Waveform normal
YES
NO
Q620
END

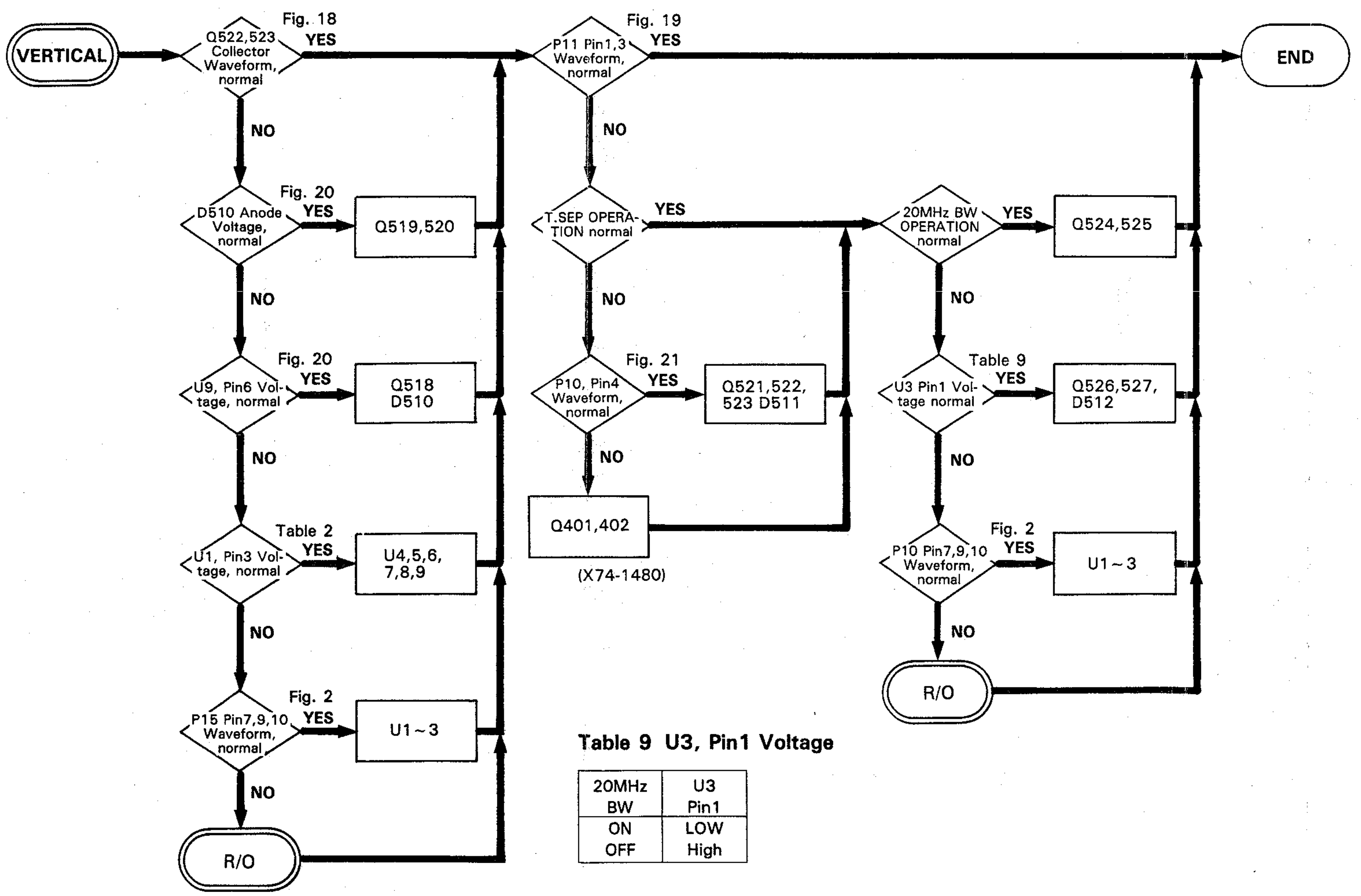

VERTICAL
Q522,523 Collector Waveform, normal
Fig. 18
YES
NO
D510 Anode Voltage, normal
Fig. 20
YES
Q519,520
NO
U9, Pin6 Voltage, normal
Fig. 20
YES
Q518 D510
NO
U1, Pin3 Voltage, normal
Table 2
YES
U4,5,6, 7,8,9
NO
P15 Pin7,9,10 Waveform, normal
Fig. 2
YES
U1~3
NO
R/O
P11 Pin1,3 Waveform, normal
Fig. 19
YES
NO
T.SEP OPERATION normal
YES
NO
P10, Pin4 Waveform, normal
Fig. 21
YES
Q521,522, 523 D511
NO
Q401,402
(X74-1480)
20MHz BW OPERATION normal
YES
Q524,525
NO
U3 Pin1 Voltage normal
Table 9
YES
Q526,527, D512
NO
P10 Pin7,9,10 Waveform, normal
Fig. 2
YES
U1~3
NO
R/O
END

Table 9 U3, Pin1 Voltage

20MHz BW	U3 Pin1
ON	LOW
OFF	High

H-MODE "X-Y"
Input: 40mVp-p 1kHz
Sine Wave
Volts/div: 5mV/div

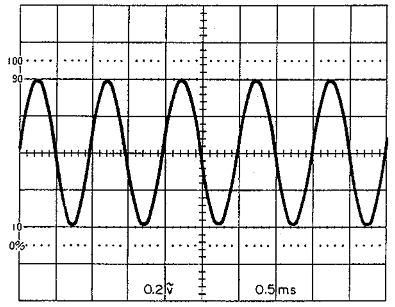


Fig. 16 DC +2.4V

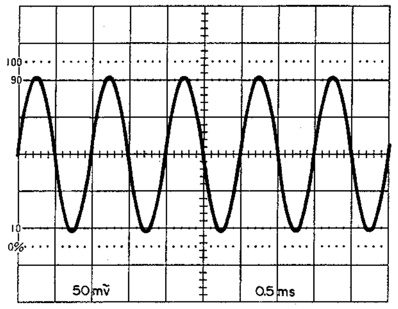


Fig. 17 DC +5V

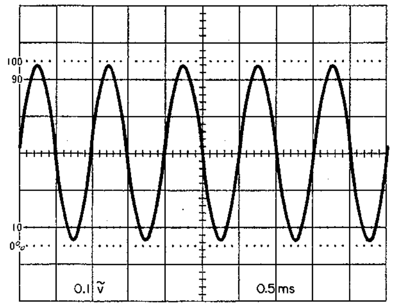


Fig. 18 DC −5.0V

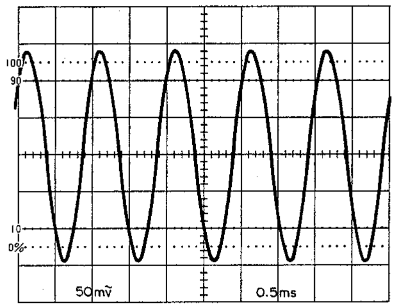
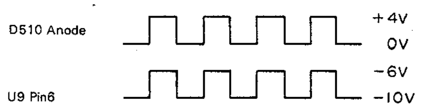
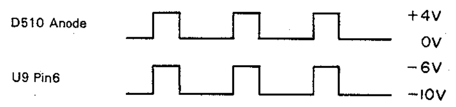


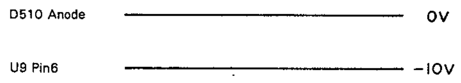
Fig. 19 DC +5V



(a) V-MODE "ADD" + The other one

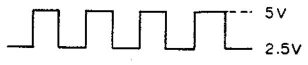


(b) V-MODE "ADD" + CH × 2

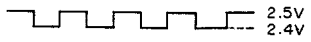


(c) V-MODE "ADD" is not selected

Fig. 20 D510 Anode, U9, Pin6 Waveform



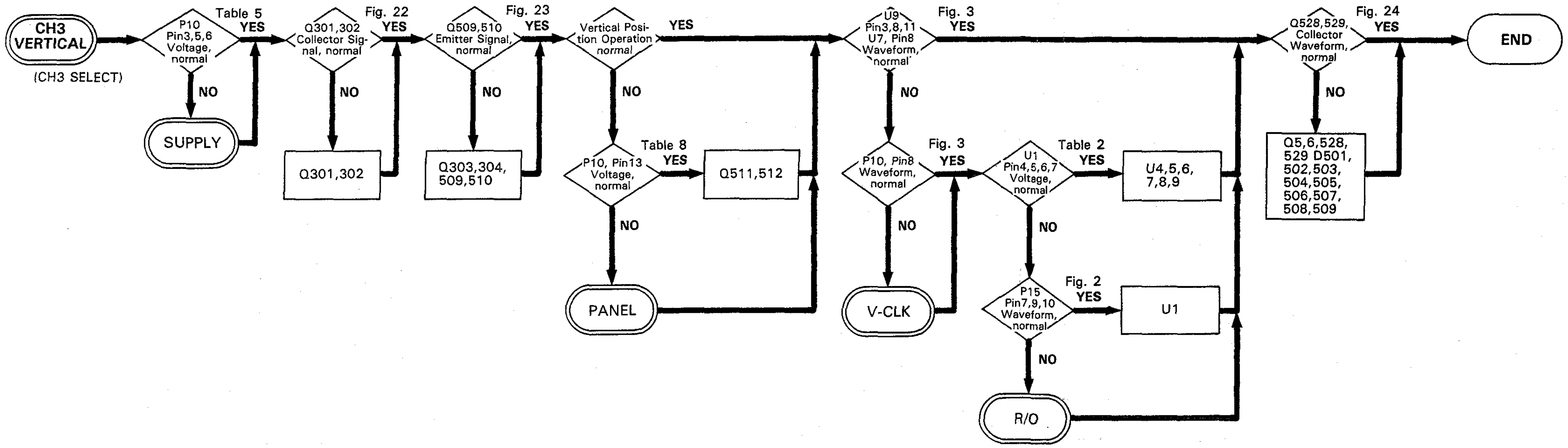
(a) T. SEP FULLY CCW



(b) T. SEP FULLY CW

Fig. 21 T. SEP. P10 Pin4 Waveform H-MODE "ALT"

TROUBLESHOOTING


CH3 VERTICAL
(CH3 SELECT)
P10 Pin3,5,6 Voltage, normal
Table 5
YES
NO
SUPPLY
Q301,302 Collector Signal, normal
Fig. 22
YES
NO
Q301,302
Q509,510 Emitter Signal, normal
Fig. 23
YES
NO
Q303,304, 509,510
Vertical Position Operation normal
YES
NO
P10, Pin13 Voltage, normal
Table 8
YES
Q511,512
NO
PANEL
U9 Pin3,8,11 U7, Pin8 Waveform, normal
Fig. 3
YES
NO
P10, Pin8 Waveform, normal
Fig. 3
YES
NO
V-CLK
U1 Pin4,5,6,7 Voltage, normal
Table 2
YES
U4,5,6, 7,8,9
NO
P15 Pin7,9,10 Waveform, normal
Fig. 2
YES
U1
NO
R/O
Q528,529, Collector Waveform, normal
Fig. 24
YES
END
NO
Q5,6,528, 529 D501, 502,503, 504,505, 506,507, 508,509

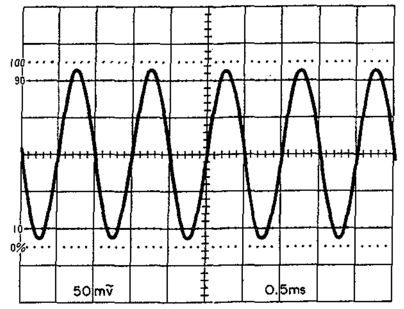


Fig. 22 DC −5.0V

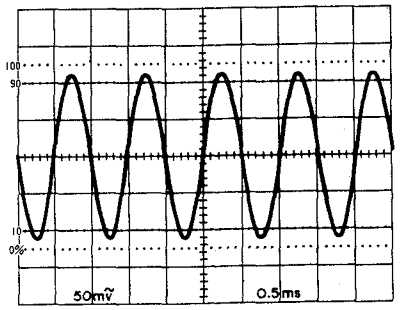
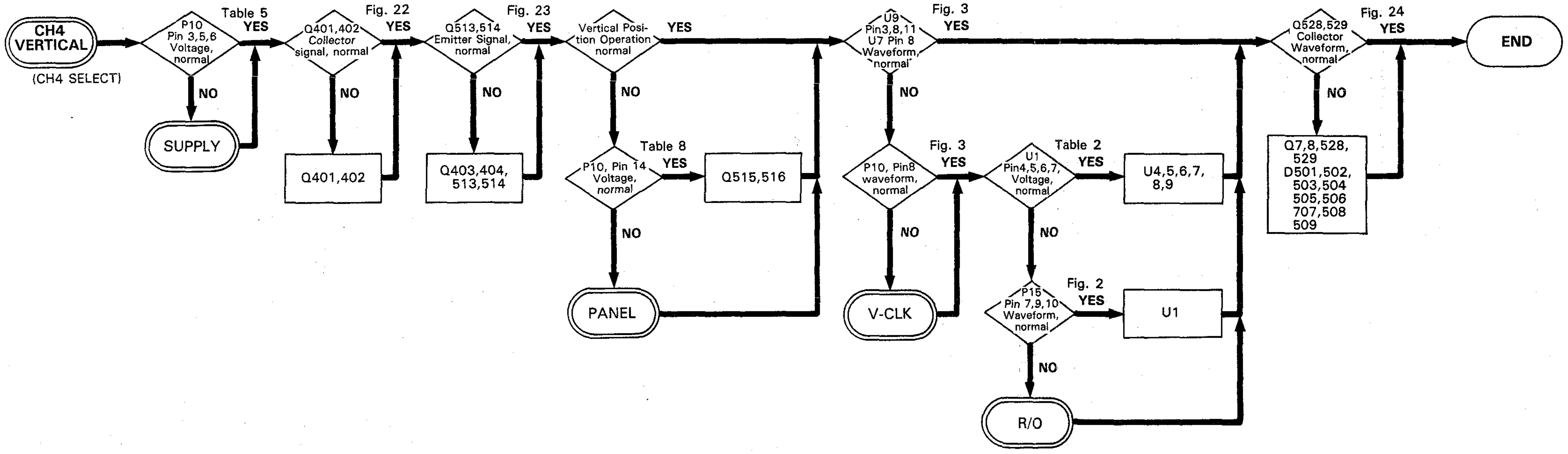


Fig. 23 DC +5.0V


CH4 VERTICAL
(CH4 SELECT)
P10 Pin 3,5,6 Voltage, normal
Table 5
YES
NO
SUPPLY
Q401,402 Collector signal, normal
Fig. 22
YES
NO
Q401,402
Q513,514 Emitter Signal, normal
Fig. 23
YES
NO
Q403,404, 513,514
Vertical Position Operation normal
YES
NO
P10, Pin 14 Voltage, normal
Table 8
YES
Q515,516
NO
PANEL
U9 Pin3,8,11 U7 Pin 8 Waveform, normal
Fig. 3
YES
NO
P10, Pin8 waveform, normal
Fig. 3
YES
NO
V-CLK
U1 Pin4,5,6,7, Voltage, normal
Table 2
YES
U4,5,6,7, 8,9
NO
P15 Pin 7,9,10 Waveform, normal
Fig. 2
YES
U1
NO
R/O
Q528,529 Collector Waveform, normal
Fig. 24
YES
END
NO
Q7,8,528, 529 D501,502, 503,504 505,506 707,508 509

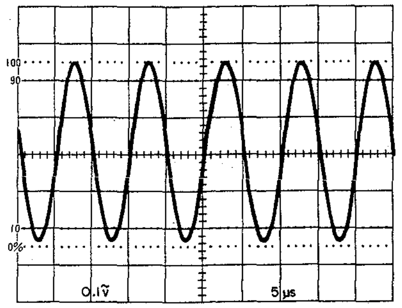
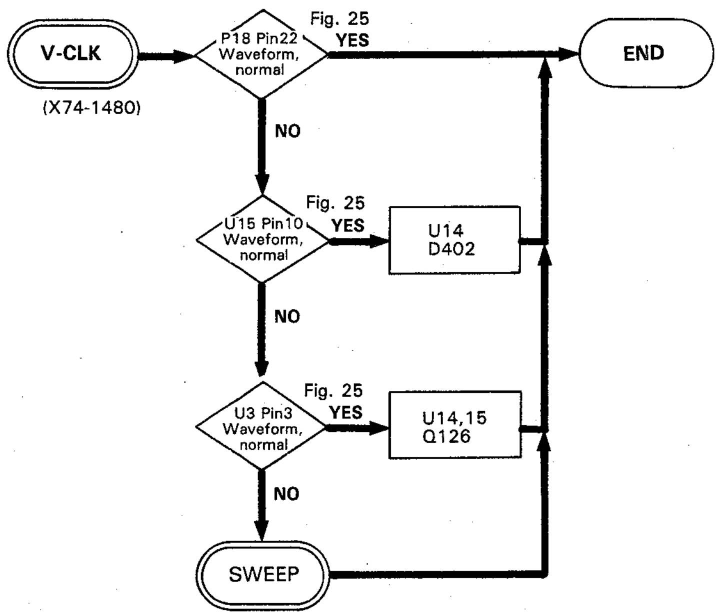
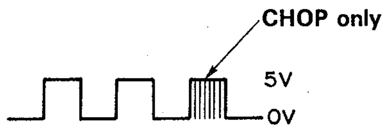


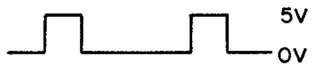
Fig. 24 DC −5.0V
Input 0.8Vp-p Sine Wave

TROUBLESHOOTING

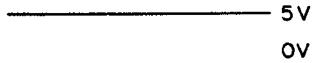

V-CLK
(X74-1480)
P18 Pin22 Waveform, normal
Fig. 25
YES
END
NO
U15 Pin10 Waveform, normal
Fig. 25
YES
U14
D402
NO
U3 Pin3 Waveform, normal
Fig. 25
YES
U14,15
Q126
NO
SWEEP


CHOP only
5V
0V

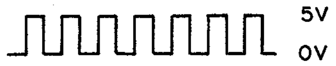
(a) H-MODE A, A INT B, B



(b) H-MODE ALT



(c) H-MODE X-Y SGL



(d) H-MODE X-Y ALT

Fig. 25 Waveform

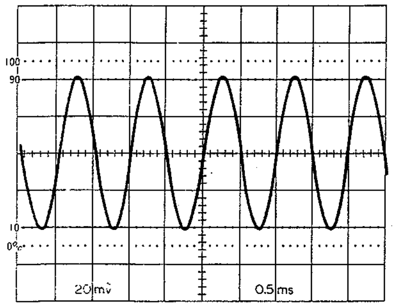


Fig. 26 DC +5V

Table 10 INPUT Voltage

Ref. No.	Pin No.	Voltage [V]
P4	2	+5
P9	2	−10
P9	3	+10

Table 11

Volts/div	X75-1180		X73-1760			
	1/10 ATT	1/100 ATT	×5 Amp	×1 Amp	1/2 ATT	1/4 ATT
1mV			○			
2			○		○	
5				○		
10				○	○	
20				○	○	○
50	○			○		
0.1V	○			○	○	
0.2	○			○	○	○
0.5		○		○		
1.0		○		○	○	
2.0		○		○	○	○
5.0	○	○		○		

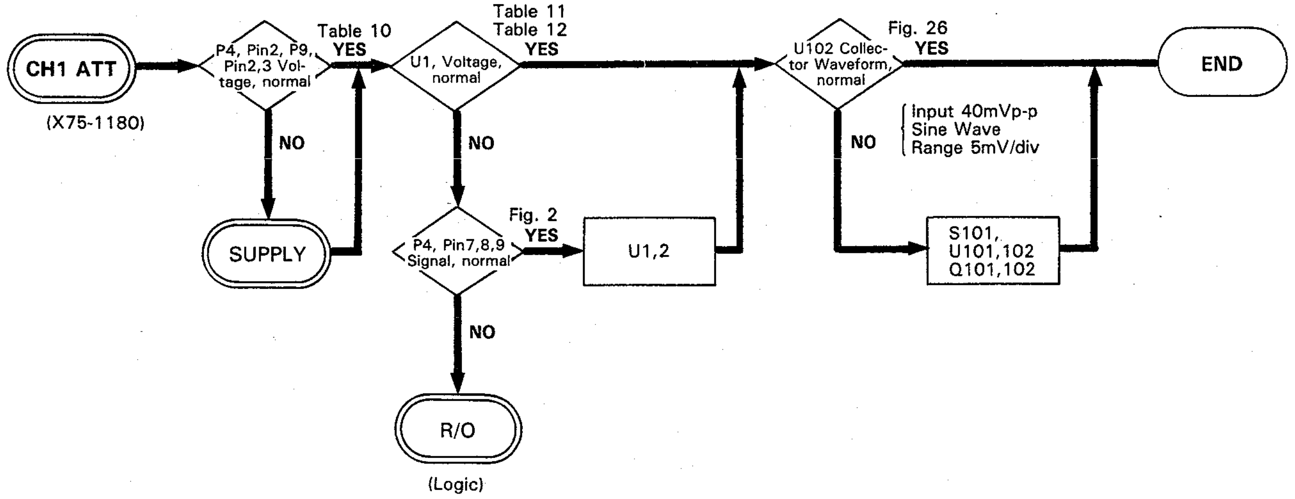
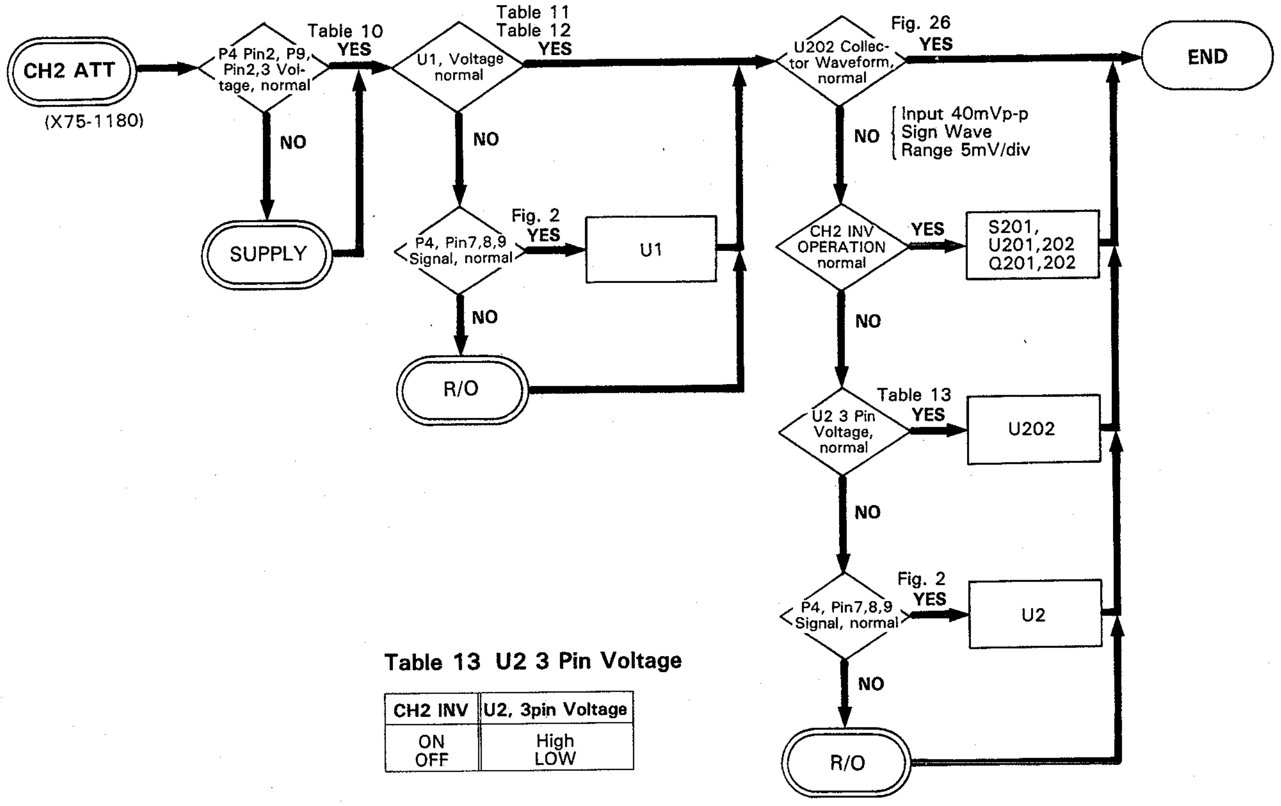

CH1 ATT
(X75-1180)
P4, Pin2, P9, Pin2,3 Voltage, normal
Table 10
YES
NO
SUPPLY
U1, Voltage, normal
Table 11
Table 12
YES
NO
P4, Pin7,8,9 Signal, normal
Fig. 2
YES
U1,2
NO
R/O
(Logic)
U102 Collector Waveform, normal
Fig. 26
YES
END
NO
Input 40mVp-p
Sine Wave
Range 5mV/div
S101,
U101,102
Q101,102

Table 12 U1, U2 FUNCTION

Pin No.	U1	U2
1	CH2 GND	
2	CH2 1/10	CH3 1/5
3	CH2 1/100	CH4 1/5
4	CH1 AC/DC	CH2 INV
5	CH1 GND	
6	CH1 1/10	
7	CH1 1/100	
15	CH2 AC/DC	

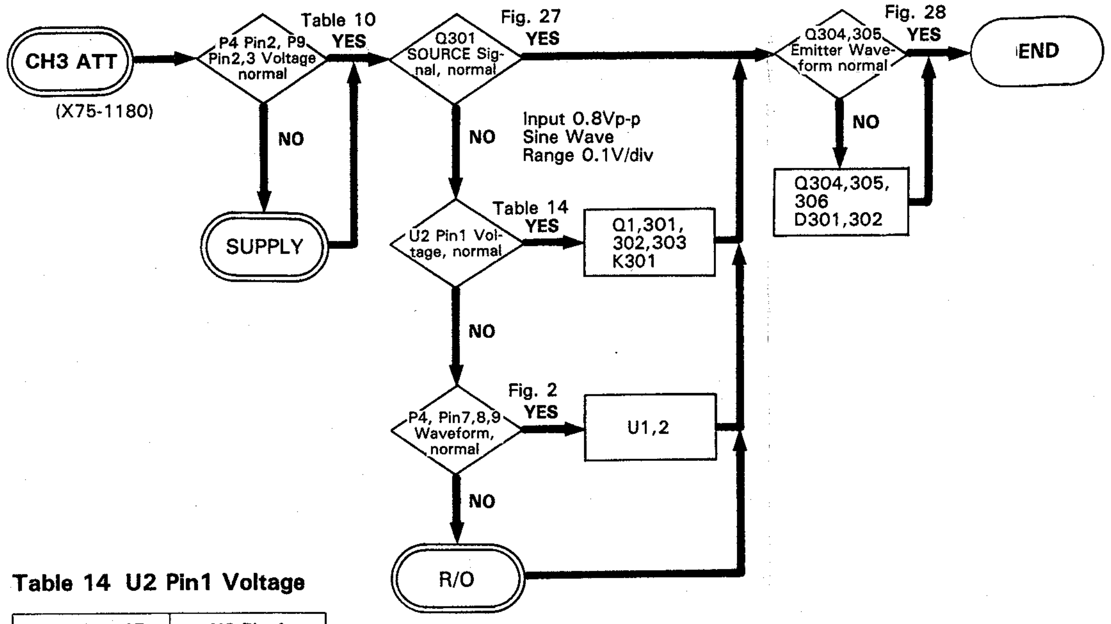
TROUBLESHOOTING



CH2 ATT
(X75-1180)
P4 Pin2, P9, Pin2,3 Voltage, normal
Table 10
YES
NO
SUPPLY
U1, Voltage normal
Table 11
Table 12
YES
NO
P4, Pin7,8,9 Signal, normal
Fig. 2
YES
U1
NO
R/O
U202 Collector Waveform, normal
Fig. 26
YES
END
NO
Input 40mVp-p
Sign Wave
Range 5mV/div
CH2 INV OPERATION normal
YES
S201, U201,202 Q201,202
NO
U2 3 Pin Voltage, normal
Table 13
YES
U202
NO
P4, Pin7,8,9 Signal, normal
Fig. 2
YES
U2
NO
R/O

Table 13 U2 3 Pin Voltage

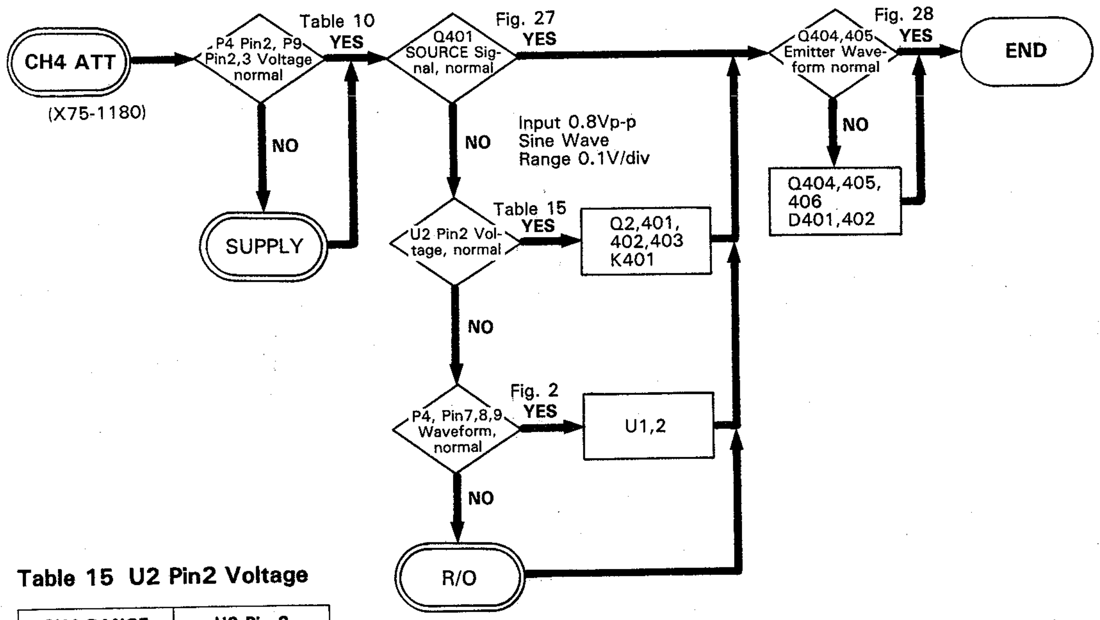
CH2 INV	U2, 3pin Voltage
ON	High
OFF	LOW



CH3 ATT
(X75-1180)
P4 Pin2, P9, Pin2,3 Voltage normal
Table 10
YES
NO
SUPPLY
Q301 SOURCE Signal, normal
Fig. 27
YES
NO
Input 0.8Vp-p
Sine Wave
Range 0.1V/div
U2 Pin1 Voltage, normal
Table 14
YES
Q1,301, 302,303 K301
NO
P4, Pin7,8,9 Waveform, normal
Fig. 2
YES
U1,2
NO
R/O
Q304,305 Emitter Waveform normal
Fig. 28
YES
END
NO
Q304,305, 306 D301,302

Table 14 U2 Pin1 Voltage

CH3 RANGE	U2 Pin 1
0.5 V/div	High
0.1 V/div	LOW



CH4 ATT
(X75-1180)
P4 Pin2, P9 Pin2,3 Voltage normal
Table 10
YES
NO
SUPPLY
Q401 SOURCE Signal, normal
Fig. 27
YES
NO
Input 0.8Vp-p
Sine Wave
Range 0.1V/div
U2 Pin2 Voltage, normal
Table 15
YES
Q2,401, 402,403 K401
NO
P4, Pin7,8,9 Waveform, normal
Fig. 2
YES
U1,2
NO
R/O
Q404,405 Emitter Waveform normal
Fig. 28
YES
END
NO
Q404,405, 406 D401,402

Table 15 U2 Pin2 Voltage

CH4 RANGE	U2 Pin 2
0.5 V/div	High
0.1 V/div	LOW

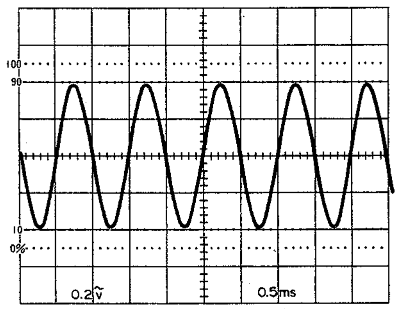


Fig. 27 DC −0.27 V

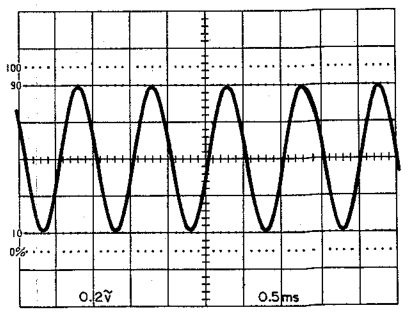


Fig. 28 DC −1.0 V

TROUBLESHOOTING

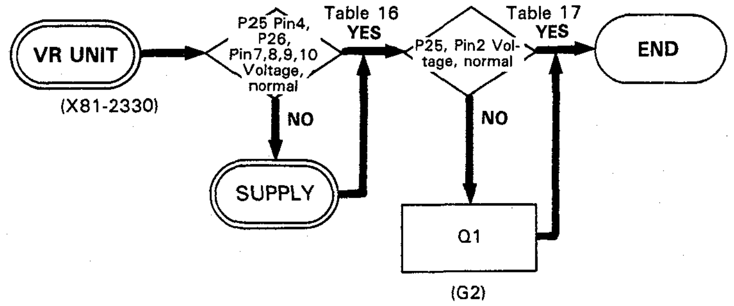

VR UNIT
(X81-2330)
P25 Pin4, P26, Pin7,8,9,10 Voltage, normal
Table 16
YES
NO
SUPPLY
P25, Pin2 Voltage, normal
Table 17
YES
NO
Q1
(G2)
END

Table 16 Voltage

P25 Pin No.	Voltage [V]
4	+140
P26 Pin No.	**Voltage [V]**
7	+10
8	−10
9	+13
10	−13

Table 17 Voltage

P25	Voltage [V]
Pin 2	+20

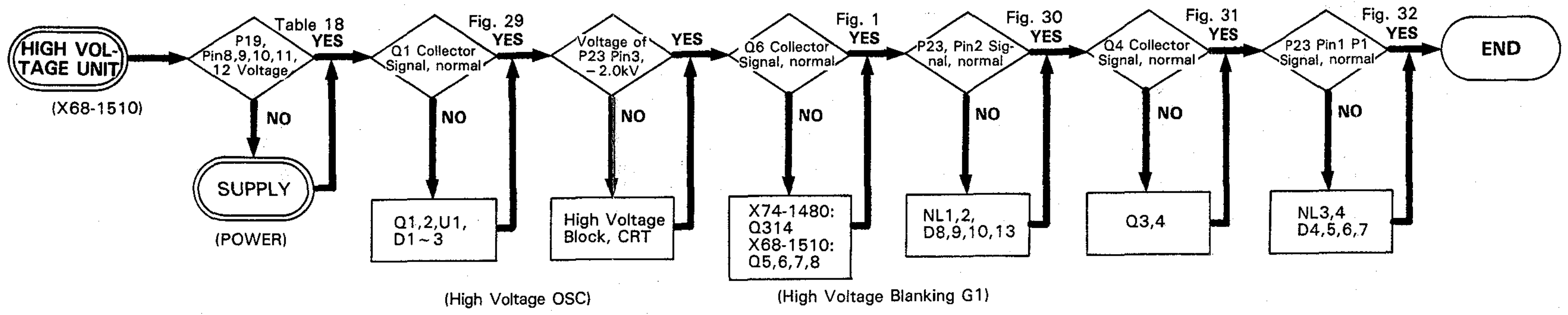

HIGH VOLTAGE UNIT
(X68-1510)
P19, Pin8,9,10,11, 12 Voltage
Table 18
YES
NO
SUPPLY
(POWER)
Q1 Collector Signal, normal
Fig. 29
YES
NO
Q1,2,U1, D1～3
Voltage of P23 Pin3, −2.0kV
YES
NO
High Voltage Block, CRT
(High Voltage OSC)
Q6 Collector Signal, normal
Fig. 1
YES
NO
X74-1480: Q314 X68-1510: Q5,6,7,8
P23, Pin2 Signal, normal
Fig. 30
YES
NO
NL1,2, D8,9,10,13
(High Voltage Blanking G1)
Q4 Collector Signal, normal
Fig. 31
YES
NO
Q3,4
P23 Pin1 P1 Signal, normal
Fig. 32
YES
NO
NL3,4 D4,5,6,7
END

Table 18

P19 Pin No.	Voltage [V]
8	+10
9	−10
10	+13
11	−13
12	+140

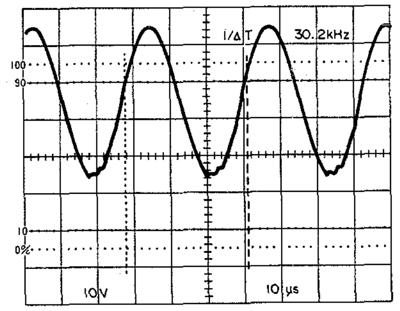


Fig. 29 Q1, Collector Waveform

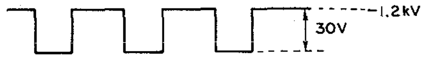


Fig. 30 G1, P23, Pin2

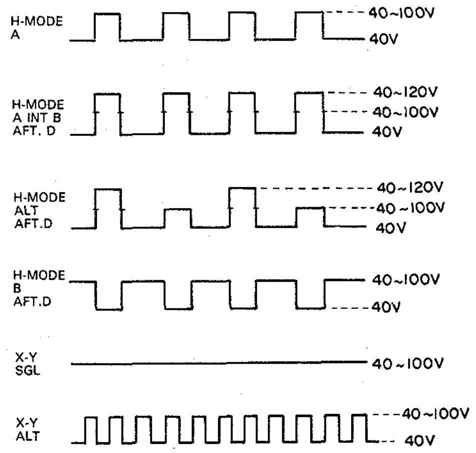


Fig. 31 Q4, Collector Signal

A SWEEP TIME = B SWEEP TIME
DELAY TIME MIN

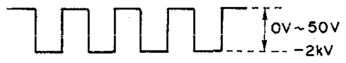


Fig. 32 P1, P23, Pin1 Signal

TROUBLESHOOTING

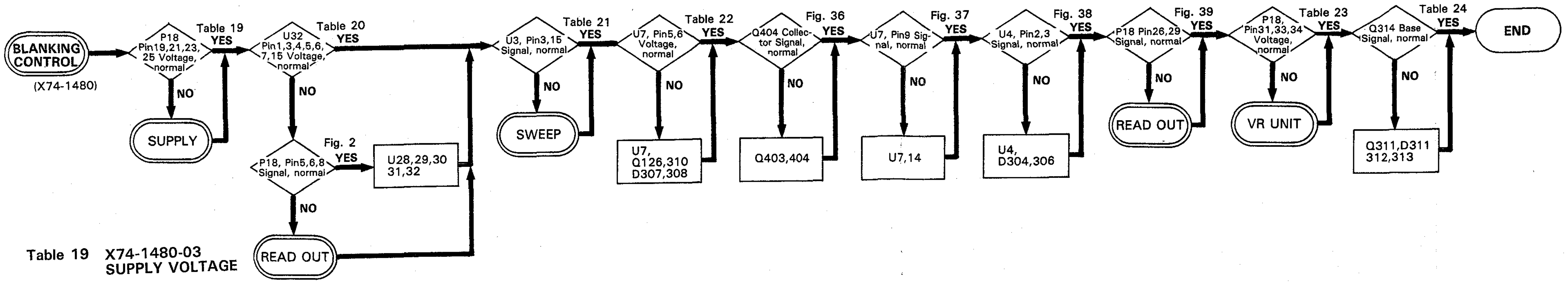

BLANKING CONTROL
(X74-1480)
P18 Pin19,21,23, 25 Voltage, normal
Table 19
YES
NO
SUPPLY
U32 Pin1,3,4,5,6, 7,15 Voltage, normal
Table 20
YES
NO
P18, Pin5,6,8 Signal, normal
Fig. 2
YES
U28,29,30 31,32
NO
READ OUT
U3, Pin3,15 Signal, normal
Table 21
YES
NO
SWEEP
U7, Pin5,6 Voltage, normal
Table 22
YES
NO
U7, Q126,310 D307,308
Q404 Collector Signal, normal
Fig. 36
YES
NO
Q403,404
U7, Pin9 Signal, normal
Fig. 37
YES
NO
U7,14
U4, Pin2,3 Signal, normal
Fig. 38
YES
NO
U4, D304,306
P18 Pin26,29 Signal, normal
Fig. 39
YES
NO
READ OUT
P18, Pin31,33,34 Voltage, normal
Table 23
YES
NO
VR UNIT
Q314 Base Signal, normal
Table 24
YES
NO
Q311,D311 312,313
END

Table 19 X74-1480-03 SUPPLY VOLTAGE

P18	Voltage [V]
Pin 19	+ 5
Pin 21	+ 5
Pin 23	+10
Pin 25	−10

Table 20 U32 Pin VOLTAGE

HORIZ DISPLAY MODE		ALT Pin1	B Pin3	XY SGL Pin4	ATT. D Pin5	A Pin6	CHOP Pin15
A		H	H	L	H	L	V-MODE ALT "H"
A INT B	NORM	H	H	L	H	H	
	AFT. D	H	H	L	L	H	
ALT	NORM	L	H	L	H	H	V-MODE CHOP "L"
	AFT. D	L	H	L	L	H	
B	NORM	H	L	L	H	H	
	AFT. D	H	L	L	L	H	
X-Y	SINGLE	H	H	H	H	H	
	ALT	H	H	L	H	H	

Table 21 U3 Pin3, 15

HORIZ DISPLAY MODE		AS Pin3	BS Pin15
A		Fig. 33	H
A INT B	NORM	Fig. 33	H
	AFT. D	Fig. 34	←
ALT	NORM	Fig. 33	H
	AFT. D	Fig. 34	←
B	NORM	Fig. 33	H
	AFT. D	Fig. 34	←
X-Y	SGL	H	H

Table 22 A $\overline{\text{STATE}}$, B $\overline{\text{STATE}}$

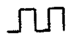
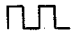
HORIZ DISPLAY MODE	B $\overline{\text{STATE}}$ U7 Pin 5	A $\overline{\text{STATE}}$ U7 Pin6
A	H	L
A INT B	H	L
ALT		
B	L	H
X-Y	H	L

Table 23 A,B, R/O INTEN Voltage

	FULLY CW INTEN MAX ~ FULLY CCW INTEN MIN
A INTEN P18 Pin33	−10V ~ +10V
B INTEN P28 Pin34	−10V ~ +10V
R/O INTEN P18 Pin31	−10V ~ +10V

Table 24 Q314 Base Signal

HORIZ DISPLAY MODE	Q314 Base Signal
A	Fig. 35
A INT B AFT. D	Fig. 35
ALT AFT.D	Fig. 35
B AFT.D	Fig. 35
X-Y	0.5 ~ 1.8V

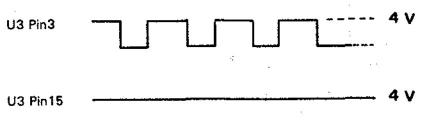

U3 Pin3
4 V
U3 Pin15
4 V

Fig. 33 HORIZ MODE "A"

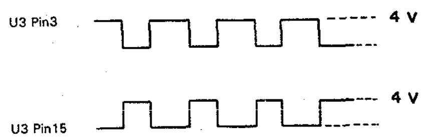

U3 Pin3
4 V
U3 Pin15
4 V

Fig. 34 HORIZ MODE "A INT B" "ALT"
AFT D, Delay time Min
B SWEEP TIME = A SWEEP TIME

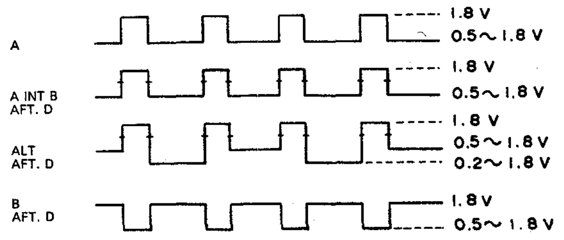

A
1.8 V
0.5～1.8 V
A INT B AFT. D
1.8 V
0.5～1.8 V
ALT AFT. D
1.8 V
0.5～1.8 V
0.2～1.8 V
B AFT. D
1.8 V
0.5～1.8 V

Fig. 35 Q314 Base Signal

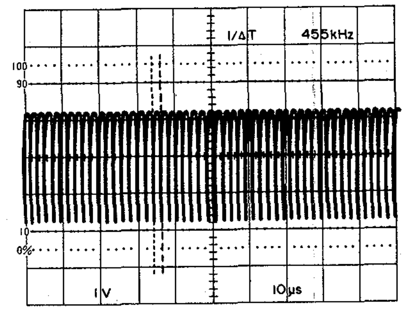
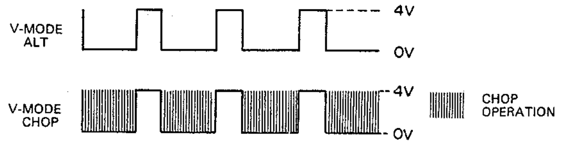
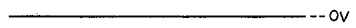


Fig. 36 Q404 Collector Signal

TROUBLESHOOTING

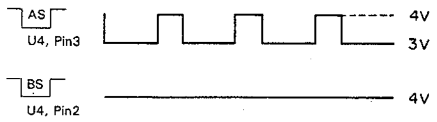

V-MODE ALT
4V
0V
V-MODE CHOP
4V
0V
CHOP OPERATION

(a) H-MODE "ALT"

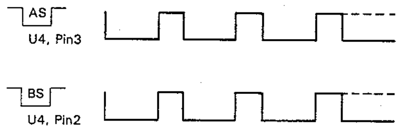


(b) H-MODE THE OTHER

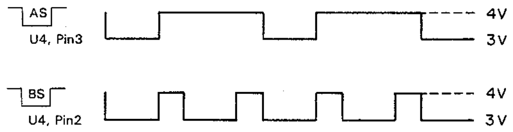
Fig. 37 U7, Pin9 Signal


AS
U4, Pin3
4V
3V
BS
U4, Pin2
4V

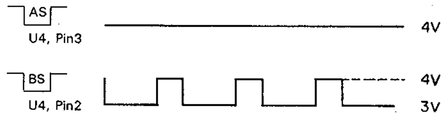
(a) H-MODE "A"


AS
U4, Pin3
4V
3V
BS
U4, Pin2
4V
3V

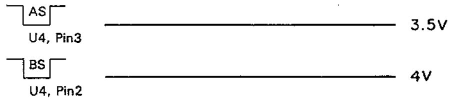
(b) H-MODE "A INT B"
A SWEEP TIME = B SWEEP TIME
DELAY TIME MIN


AS
U4, Pin3
4V
3V
BS
U4, Pin2
4V
3V

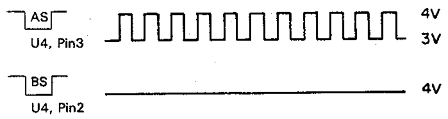
(c) H-MODE "ALT"
A SWEEP TIME = B SWEEP TIME
DELAY TIME MIN


AS
U4, Pin3
4V
BS
U4, Pin2
4V
3V

(d) H-MODE "D"
A SWEEP TIME = B SWEEP TIME
DELAY TIME MIN


AS
U4, Pin3
3.5V
BS
U4, Pin2
4V

(e) H-MODE "X-Y" SGL


AS
U4, Pin3
4V
3V
BS
U4, Pin2
4V

(f) H-MODE "X-Y" ALT

Fig. 38 U4, Pin2,3 Signal

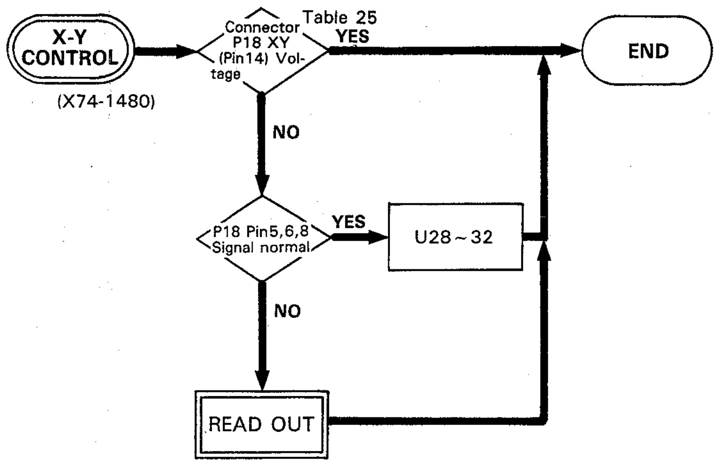
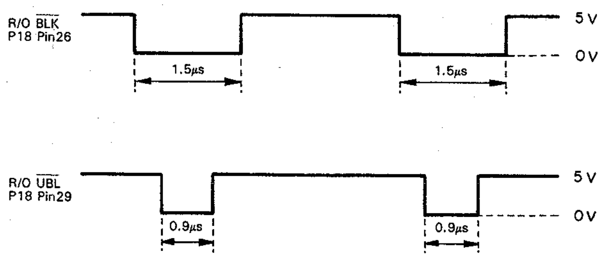
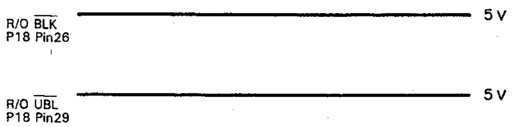

X-Y CONTROL
(X74-1480)
Connector P18 XY (Pin14) Voltage
Table 25
YES
NO
END
P18 Pin5,6,8 Signal normal
YES
U28～32
NO
READ OUT

Table 25 X-Y Signal

X-Y	P18 Pin14 X-Y
ON	L
OFF	H


R/O $\overline{\text{BLK}}$
P18 Pin26
5V
0V
1.5μs
1.5μs
R/O $\overline{\text{UBL}}$
P18 Pin29
5V
0V
0.9μs
0.9μs

(a) R/O ON


R/O $\overline{\text{BLK}}$
P18 Pin26
5V
R/O $\overline{\text{UBL}}$
P18 Pin29
5V

(b) R/O OFF

Fig. 39 P18 Pin26, 29, R/O $\overline{\text{BLK}}$, R/O $\overline{\text{UBL}}$ Signal

TROUBLESHOOTING

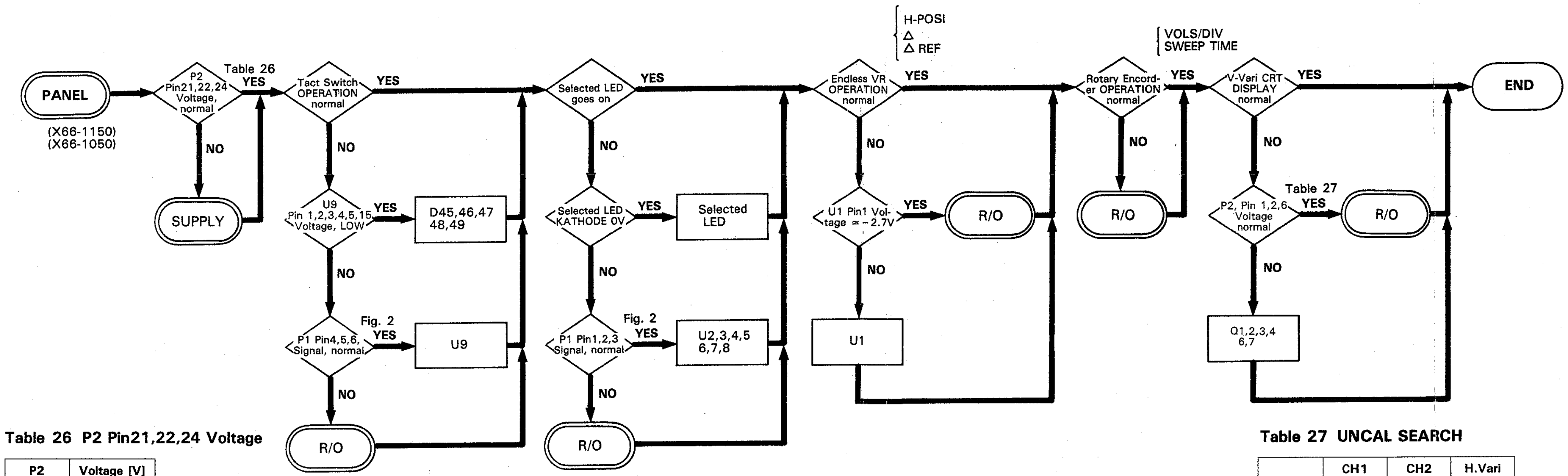

PANEL
(X66-1150)
(X66-1050)
P2 Pin21,22,24 Voltage, normal
Table 26
YES
NO
SUPPLY
Tact Switch OPERATION normal
YES
NO
U9 Pin 1,2,3,4,5,15 Voltage, LOW
YES
D45,46,47 48,49
NO
P1 Pin4,5,6, Signal, normal
Fig. 2
YES
U9
NO
R/O
Selected LED goes on
YES
NO
Selected LED KATHODE 0V
YES
Selected LED
NO
P1 Pin1,2,3 Signal, normal
Fig. 2
YES
U2,3,4,5 6,7,8
NO
R/O
H-POSI
Δ
Δ REF
Endless VR OPERATION normal
YES
NO
U1 Pin1 Voltage ≈ −2.7V
YES
R/O
NO
U1
VOLS/DIV
SWEEP TIME
Rotary Encorder OPERATION normal
YES
NO
R/O
V-Vari CRT DISPLAY normal
YES
NO
P2, Pin 1,2,6 Voltage normal
Table 27
YES
R/O
NO
Q1,2,3,4 6,7
END

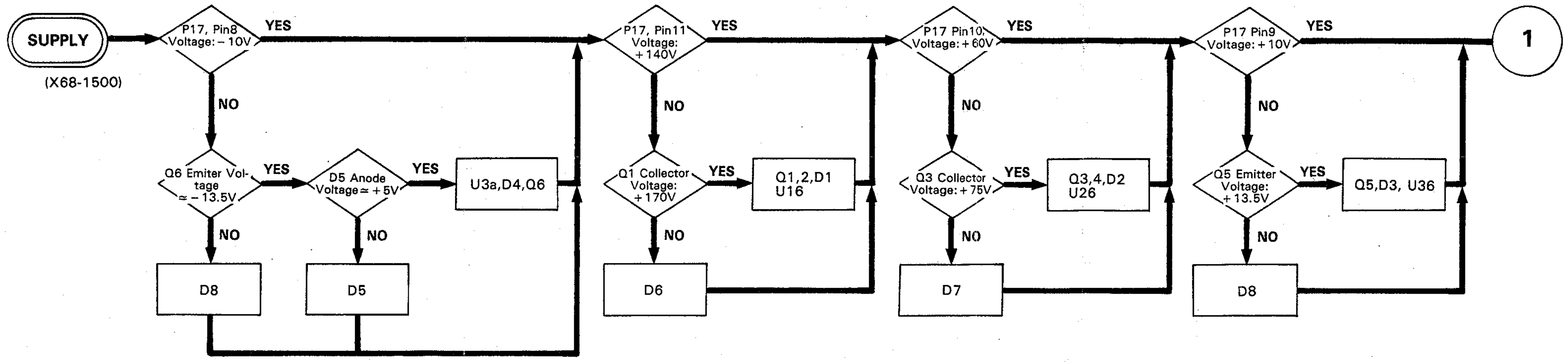
Table 26 P2 Pin21,22,24 Voltage

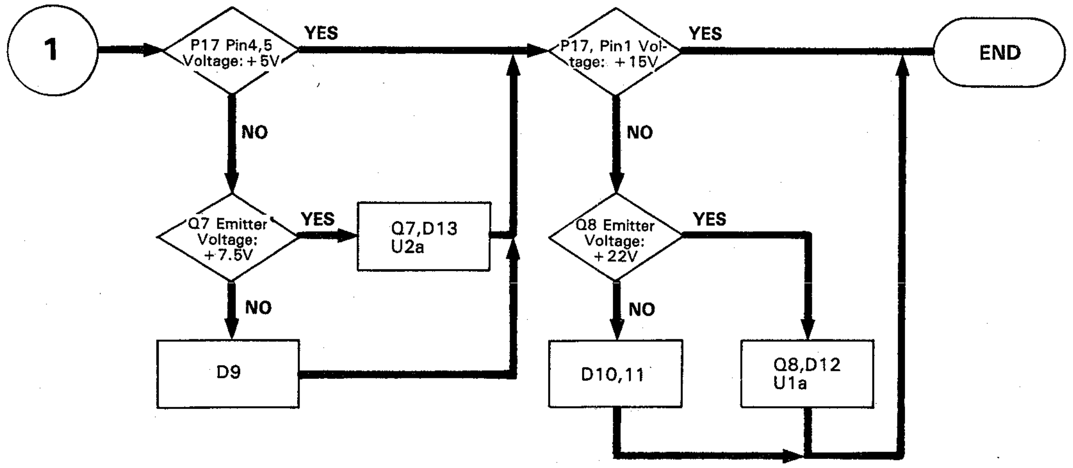
P2	Voltage [V]
Pin 21	+10
22	−10
24	+5

Table 27 UNCAL SEARCH

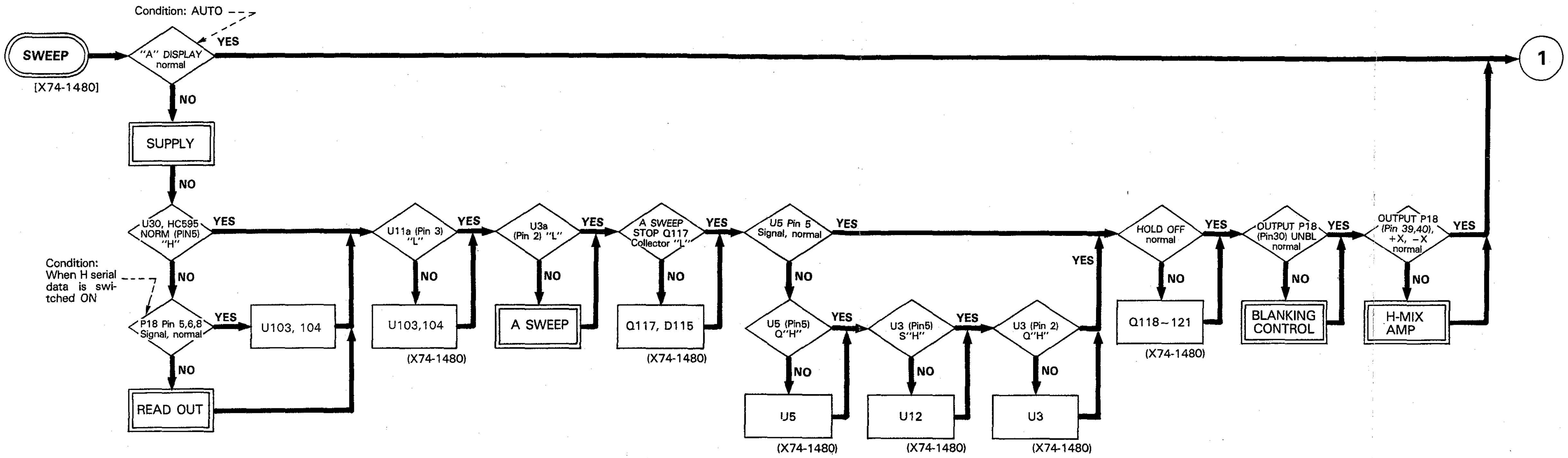
	CH1 P2, Pin1	CH2 P2, Pin2	H.Vari P2, Pin6
CAL	+0.12 [V]	+0.12 [V]	+4.85 [V]
UNCAL	+4.85 [V]	+4.85 [V]	+0.12 [V]

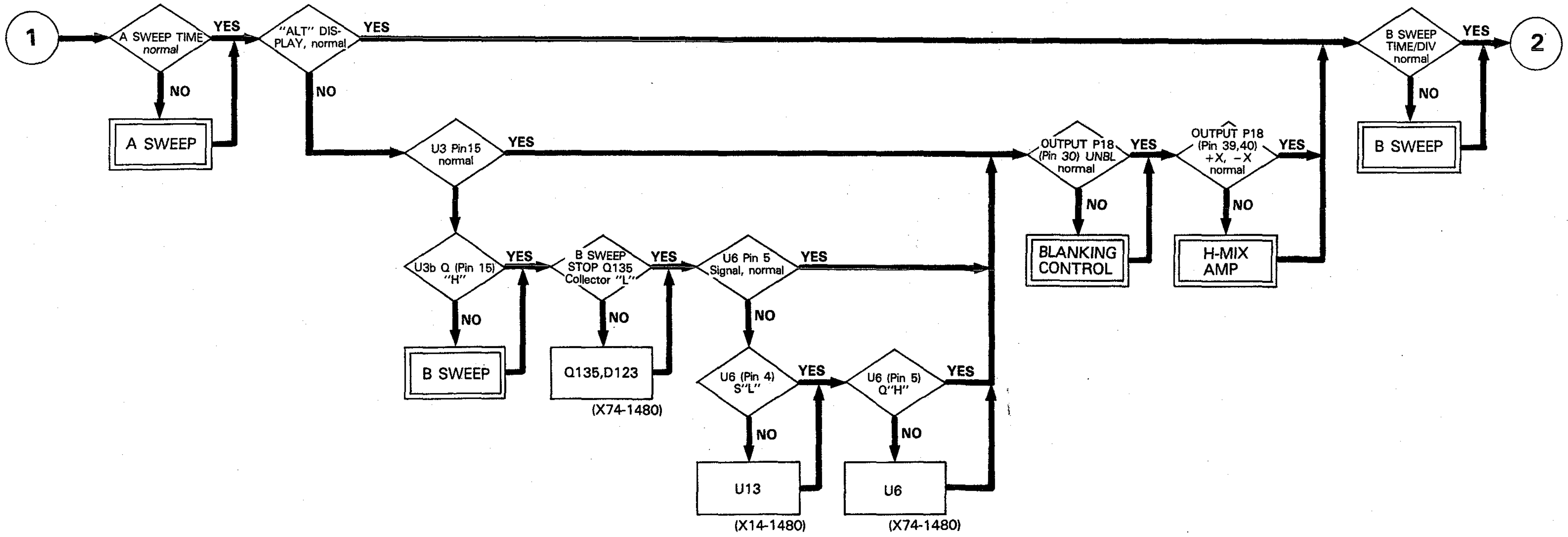
TROUBLESHOOTING


SUPPLY
(X68-1500)
P17, Pin8 Voltage: − 10V
YES
NO
Q6 Emitter Voltage ≃ − 13.5V
YES
NO
D5 Anode Voltage ≃ + 5V
YES
NO
U3a,D4,Q6
D8
D5
P17, Pin11 Voltage: + 140V
YES
NO
Q1 Collector Voltage: + 170V
YES
NO
Q1,2,D1 U16
D6
P17 Pin10 Voltage: + 60V
YES
NO
Q3 Collector Voltage: + 75V
YES
NO
Q3,4,D2 U26
D7
P17 Pin9 Voltage: + 10V
YES
NO
Q5 Emitter Voltage: + 13.5V
YES
NO
Q5,D3, U36
D8
1

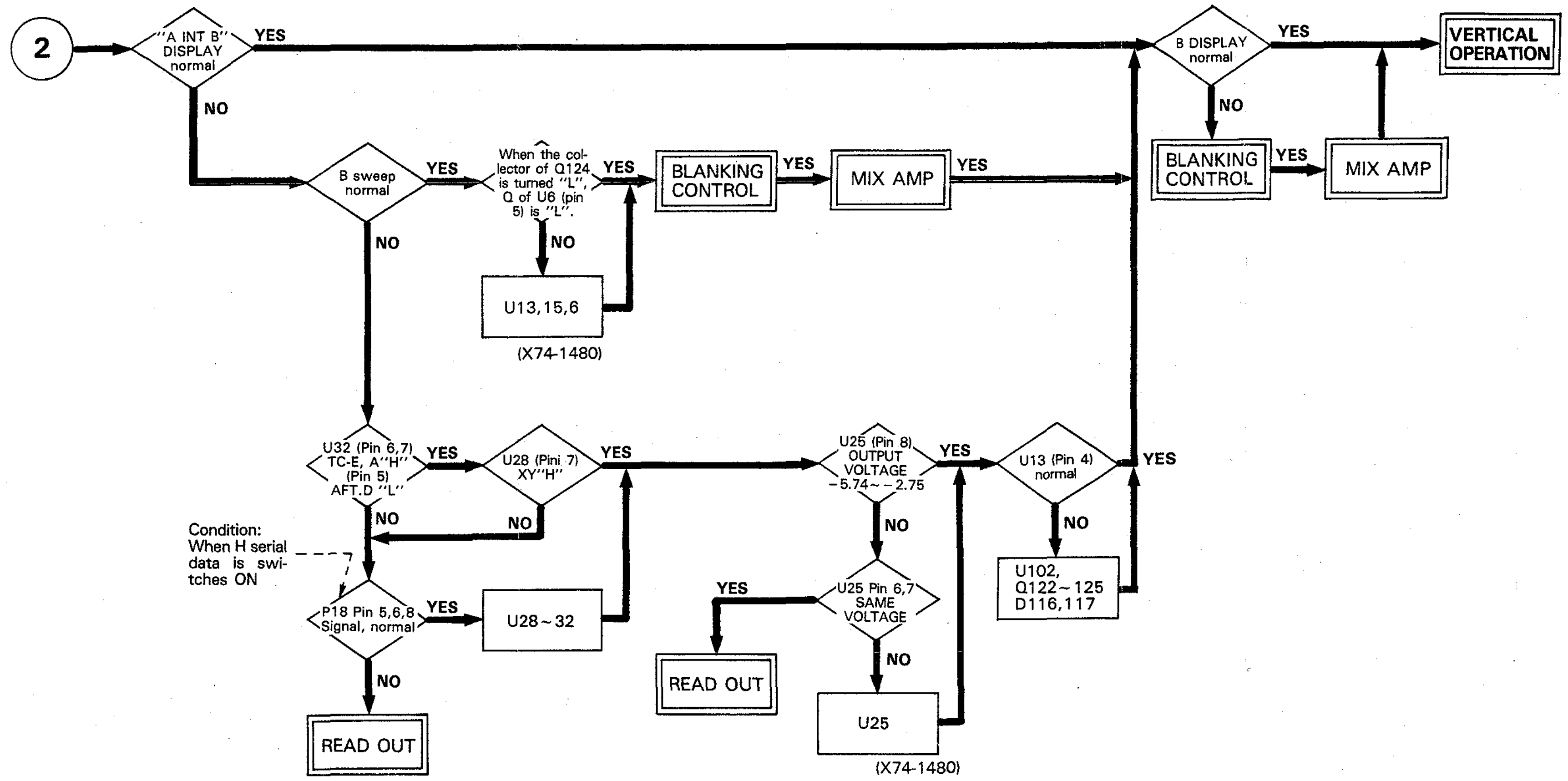

1
P17 Pin4,5 Voltage: + 5V
YES
NO
Q7 Emitter Voltage: + 7.5V
YES
NO
Q7,D13 U2a
D9
P17, Pin1 Voltage: + 15V
YES
NO
Q8 Emitter Voltage: + 22V
YES
NO
D10,11
Q8,D12 U1a
END

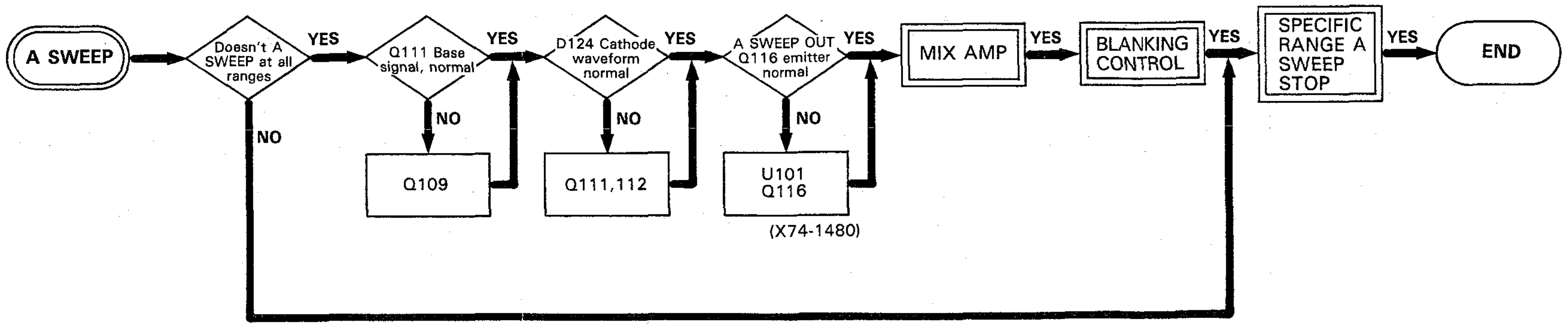
TROUBLESHOOTING


Condition: AUTO
SWEEP
[X74-1480]
"A" DISPLAY normal
YES
NO
SUPPLY
NO
U30, HC595 NORM (PIN5) "H"
YES
Condition: When H serial data is switched ON
NO
P18 Pin 5,6,8 Signal, normal
YES
U103, 104
NO
READ OUT
U11a (Pin 3) "L"
YES
NO
U103,104
(X74-1480)
U3a (Pin 2) "L"
YES
NO
A SWEEP
A SWEEP STOP Q117 Collector "L"
YES
NO
Q117, D115
(X74-1480)
U5 Pin 5 Signal, normal
YES
NO
U5 (Pin5) Q"H"
YES
NO
U5
(X74-1480)
U3 (Pin5) S"H"
YES
NO
U12
(X74-1480)
U3 (Pin 2) Q"H"
YES
NO
U3
(X74-1480)
HOLD OFF normal
YES
NO
Q118~121
(X74-1480)
OUTPUT P18 (Pin30) UNBL normal
YES
NO
BLANKING CONTROL
OUTPUT P18 (Pin 39,40), +X, -X normal
YES
NO
H-MIX AMP
1

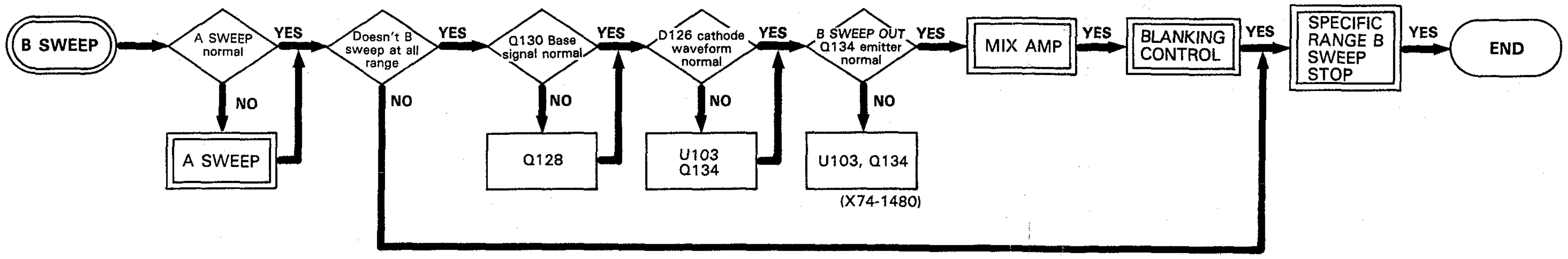

1
A SWEEP TIME normal
YES
NO
A SWEEP
"ALT" DISPLAY, normal
YES
NO
U3 Pin15 normal
YES
U3b Q (Pin 15) "H"
YES
NO
B SWEEP
B SWEEP STOP Q135 Collector "L"
YES
NO
Q135,D123
(X74-1480)
U6 Pin 5 Signal, normal
YES
NO
U6 (Pin 4) S"L"
YES
NO
U13
(X14-1480)
U6 (Pin 5) Q"H"
YES
NO
U6
(X74-1480)
OUTPUT P18 (Pin 30) UNBL normal
YES
NO
BLANKING CONTROL
OUTPUT P18 (Pin 39,40) +X, -X normal
YES
NO
H-MIX AMP
B SWEEP TIME/DIV normal
YES
NO
B SWEEP
2

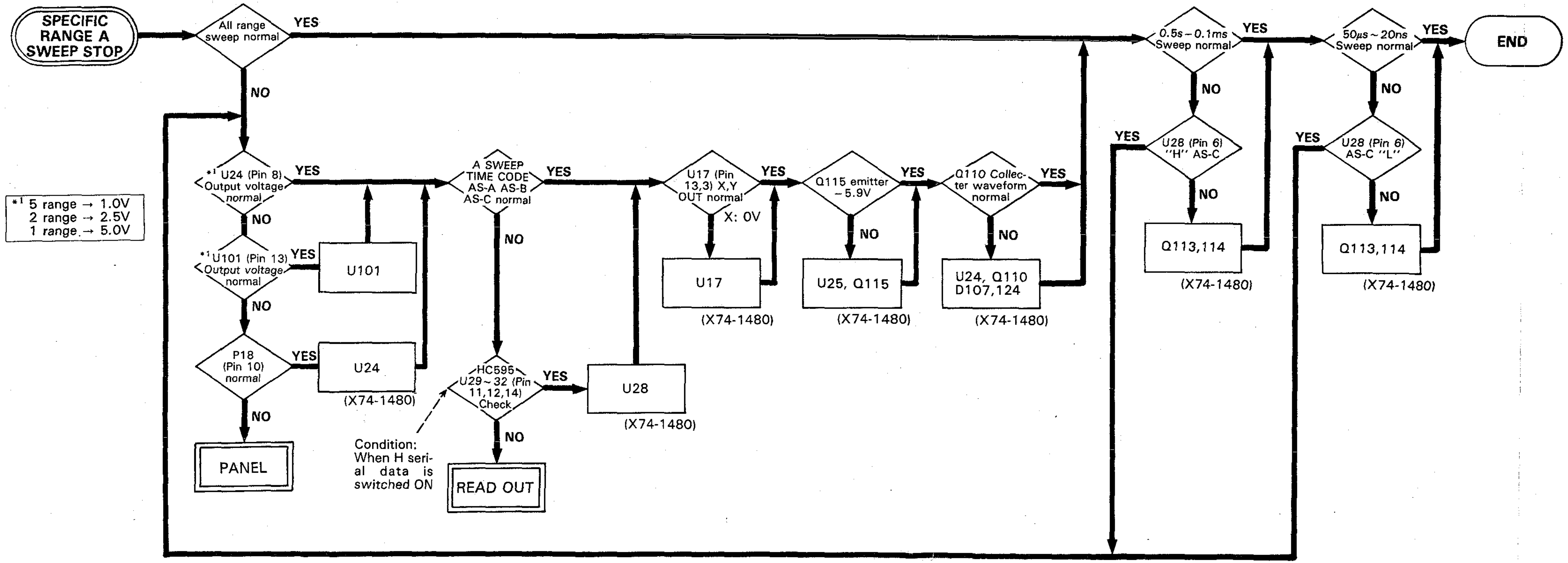
TROUBLESHOOTING

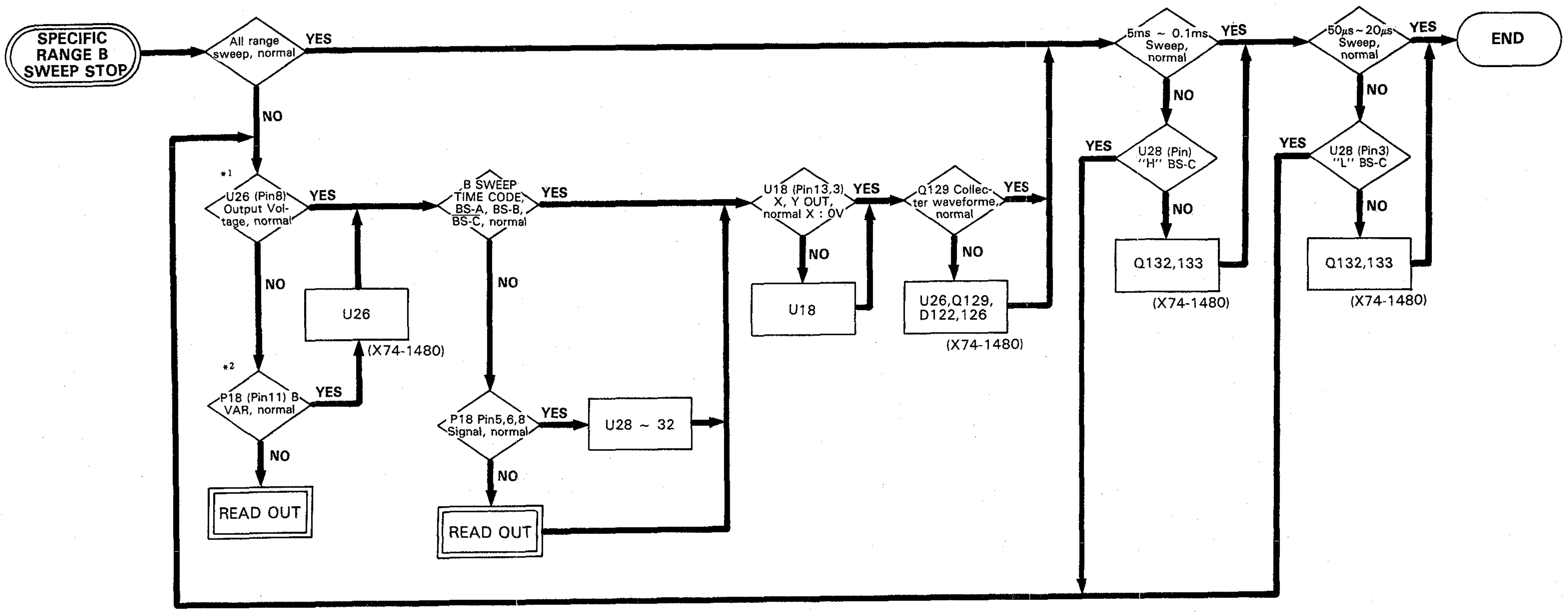

2
"A INT B" DISPLAY normal
YES
NO
B DISPLAY normal
YES
VERTICAL OPERATION
NO
BLANKING CONTROL
YES
MIX AMP
B sweep normal
YES
When the collector of Q124 is turned "L", Q of U6 (pin 5) is "L".
YES
BLANKING CONTROL
YES
MIX AMP
YES
NO
NO
U13,15,6
(X74-1480)
U32 (Pin 6,7) TC-E, A"H" (Pin 5) AFT.D "L"
YES
U28 (Pini 7) XY"H"
YES
U25 (Pin 8) OUTPUT VOLTAGE −5.74∼−2.75
YES
U13 (Pin 4) normal
YES
NO
NO
NO
NO
Condition: When H serial data is switches ON
U102, Q122∼125 D116,117
YES
U25 Pin 6,7 SAME VOLTAGE
P18 Pin 5,6,8 Signal, normal
YES
U28∼32
READ OUT
NO
NO
U25
(X74-1480)
READ OUT


A SWEEP
Doesn't A SWEEP at all ranges
YES
Q111 Base signal, normal
YES
D124 Cathode waveform normal
YES
A SWEEP OUT Q116 emitter normal
YES
MIX AMP
YES
BLANKING CONTROL
YES
SPECIFIC RANGE A SWEEP STOP
YES
END
NO
NO
NO
NO
Q109
Q111,112
U101 Q116
(X74-1480)

TROUBLESHOOTING


B SWEEP
A SWEEP normal
YES
NO
A SWEEP
Doesn't B sweep at all range
YES
NO
Q130 Base signal normal
YES
NO
Q128
D126 cathode waveform normal
YES
NO
U103
Q134
B SWEEP OUT Q134 emitter normal
YES
NO
U103, Q134
(X74-1480)
MIX AMP
YES
BLANKING CONTROL
YES
SPECIFIC RANGE B SWEEP STOP
YES
END


SPECIFIC RANGE A SWEEP STOP
All range sweep normal
YES
NO
*1 U24 (Pin 8) Output voltage normal
YES
NO
*1 5 range → 1.0V
2 range → 2.5V
1 range → 5.0V
*1 U101 (Pin 13) Output voltage normal
YES
NO
U101
P18 (Pin 10) normal
YES
NO
U24
(X74-1480)
PANEL
A SWEEP TIME CODE AS-A AS-B AS-C normal
YES
NO
HC595 U29~32 (Pin 11,12,14) Check
YES
NO
Condition: When H serial data is switched ON
READ OUT
U28
(X74-1480)
U17 (Pin 13,3) X,Y OUT normal
YES
X: 0V
U17
(X74-1480)
Q115 emitter -5.9V
YES
NO
U25, Q115
(X74-1480)
Q110 Collecter waveform normal
YES
NO
U24, Q110
D107,124
(X74-1480)
0.5s - 0.1ms Sweep normal
YES
NO
U28 (Pin 6) "H" AS-C
YES
NO
Q113,114
(X74-1480)
50μs ~ 20ns Sweep normal
YES
NO
U28 (Pin 6) AS-C "L"
YES
NO
Q113,114
(X74-1480)
END


SPECIFIC RANGE B SWEEP STOP
All range sweep, normal
YES
NO
*1
U26 (Pin8) Output Voltage, normal
YES
NO
U26
(X74-1480)
*2
P18 (Pin11) B VAR, normal
YES
NO
READ OUT
B SWEEP TIME CODE, BS-A, BS-B, BS-C, normal
YES
NO
P18 Pin5,6,8 Signal, normal
YES
U28 ~ 32
NO
READ OUT
U18 (Pin13,3) X, Y OUT, normal X : 0V
YES
NO
U18
Q129 Collecter waveforme, normal
YES
NO
U26,Q129, D122,126
(X74-1480)
5ms ~ 0.1ms Sweep, normal
YES
NO
U28 (Pin) "H" BS-C
YES
NO
Q132,133
(X74-1480)
50µs ~ 20µs Sweep, normal
YES
NO
U28 (Pin3) "L" BS-C
YES
NO
Q132,133
(X74-1480)
END

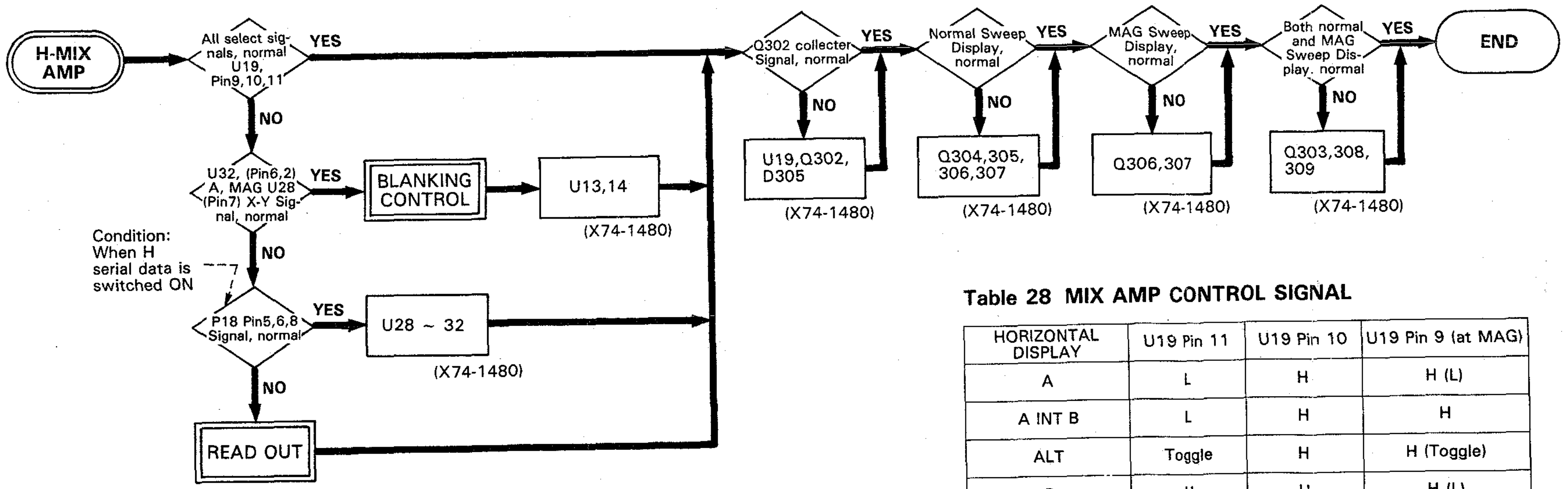
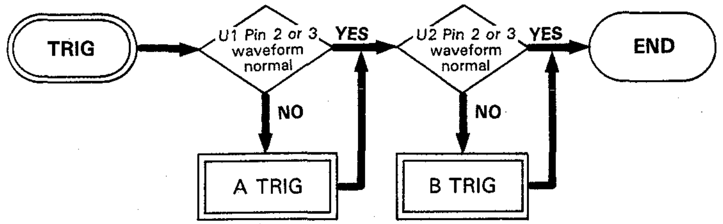
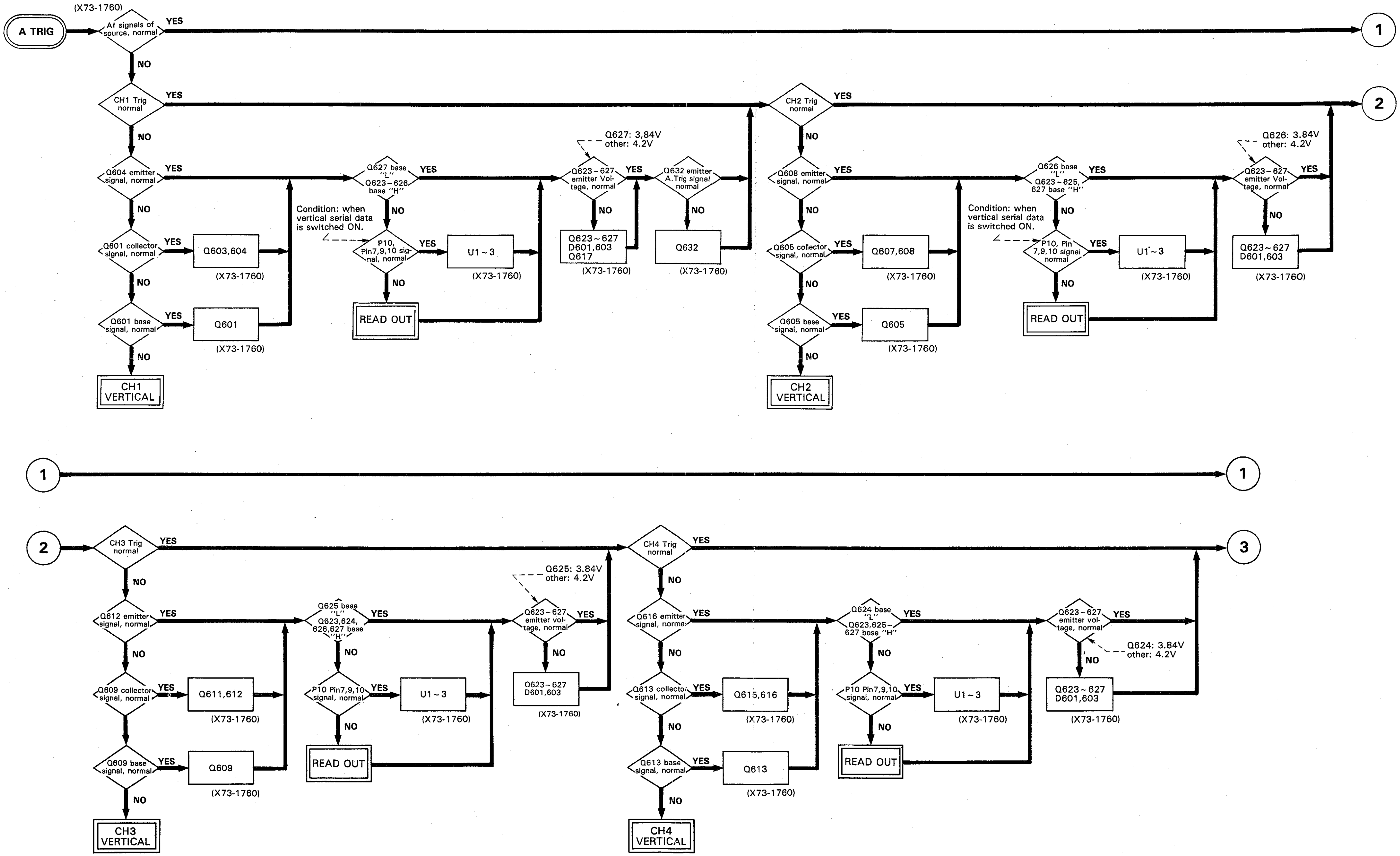

H-MIX AMP
All select signals, normal U19, Pin9,10,11
YES
NO
U32, (Pin6,2) A, MAG U28 (Pin7) X-Y Signal, normal
YES
BLANKING CONTROL
U13,14
(X74-1480)
NO
Condition: When H serial data is switched ON
P18 Pin5,6,8 Signal, normal
YES
U28 ~ 32
(X74-1480)
NO
READ OUT
Q302 collecter Signal, normal
YES
NO
U19,Q302, D305
(X74-1480)
Normal Sweep Display, normal
YES
NO
Q304,305, 306,307
(X74-1480)
MAG Sweep Display, normal
YES
NO
Q306,307
(X74-1480)
Both normal and MAG Sweep Display, normal
YES
NO
Q303,308, 309
(X74-1480)
END

Table 28 MIX AMP CONTROL SIGNAL

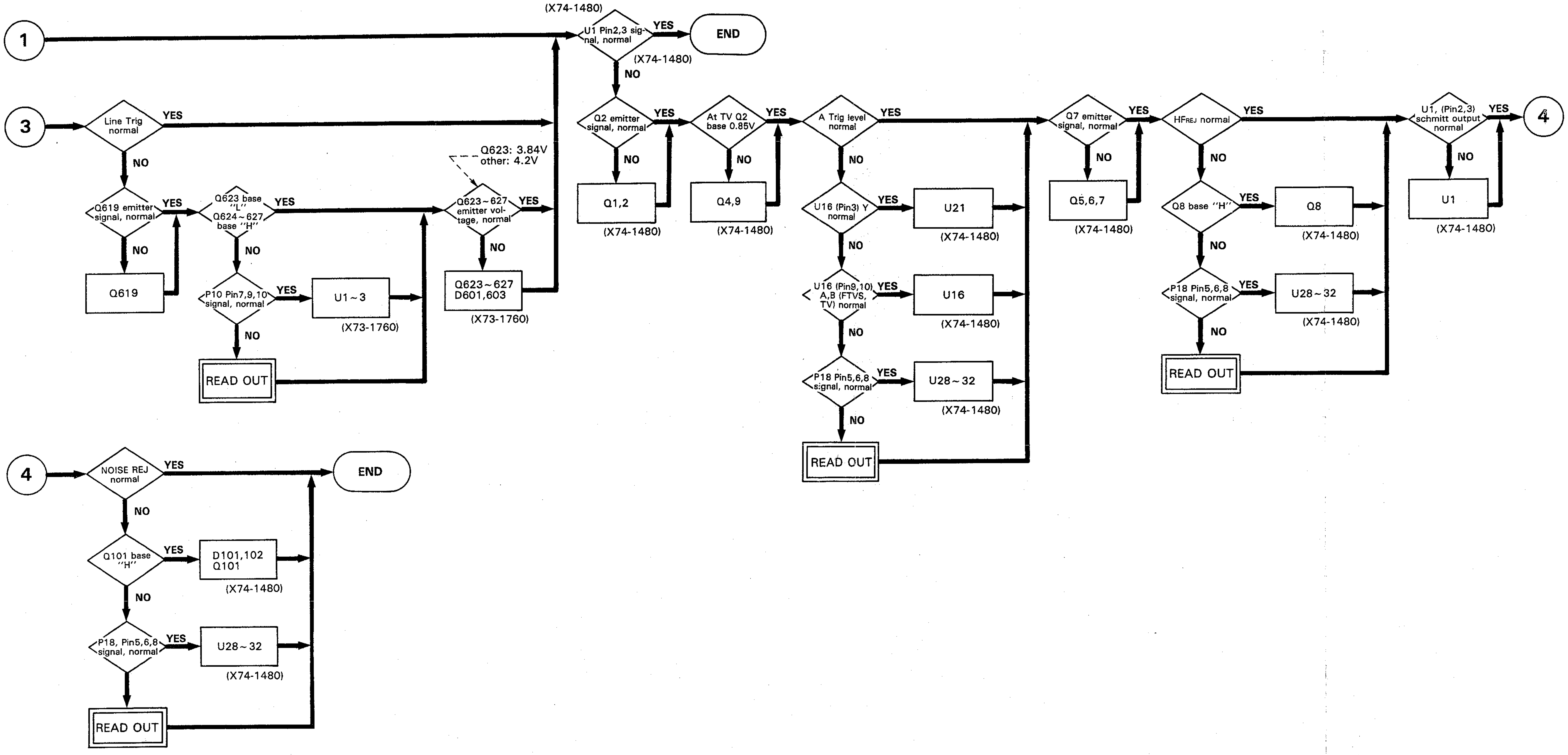
HORIZONTAL DISPLAY	U19 Pin 11	U19 Pin 10	U19 Pin 9 (at MAG)
A	L	H	H (L)
A INT B	L	H	H
ALT	Toggle	H	H (Toggle)
B	H	H	H (L)
X-Y	L	L	H


TRIG
U1 Pin 2 or 3 waveform normal
YES
NO
A TRIG
U2 Pin 2 or 3 waveform normal
YES
NO
B TRIG
END

TROUBLESHOOTING

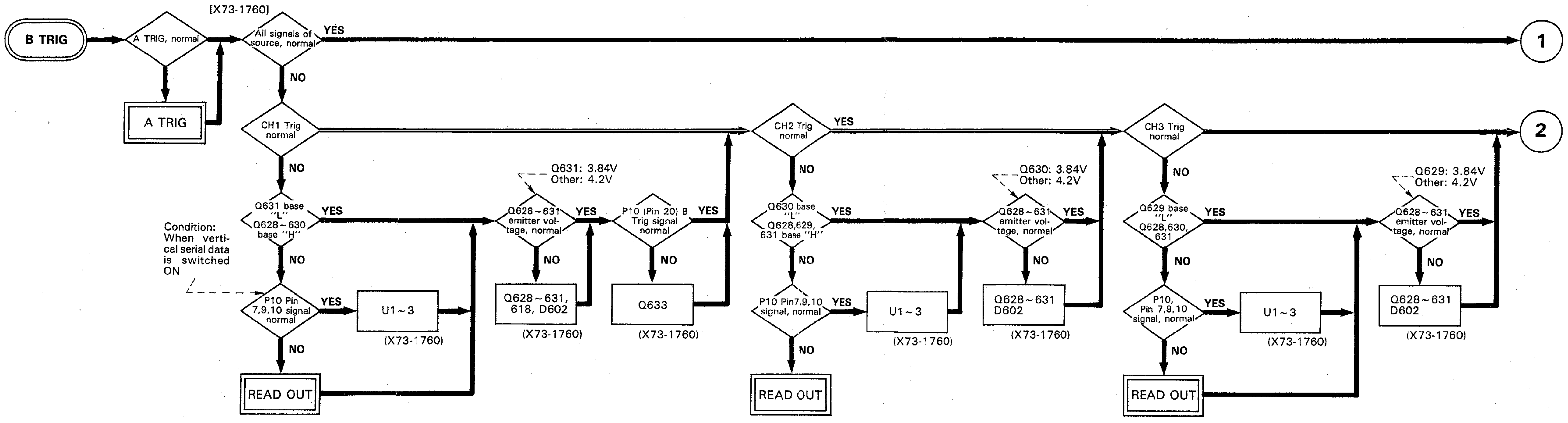

A TRIG
(X73-1760)
All signals of source, normal
YES
NO
1
CH1 Trig normal
2
Q604 emitter signal, normal
Q601 collector signal, normal
Q603,604
(X73-1760)
Q601 base signal, normal
Q601
CH1 VERTICAL
Q627 base "L" Q623~626 base "H"
Condition: when vertical serial data is switched ON.
P10, Pin7,9,10 signal, normal
U1~3
READ OUT
Q627: 3,84V
other: 4.2V
Q623~627 emitter Voltage, normal
Q623~627
D601,603
Q617
Q632 emitter A.Trig signal normal
Q632
CH2 Trig normal
Q608 emitter signal, normal
Q605 collector signal, normal
Q607,608
Q605 base signal, normal
Q605
CH2 VERTICAL
Q626 base "L" Q623~625, 627 base "H"
P10, Pin 7,9,10 signal normal
Q626: 3.84V
other: 4.2V
CH3 Trig normal
Q612 emitter signal, normal
Q609 collector signal, normal
Q611,612
Q609 base signal, normal
Q609
CH3 VERTICAL
Q625 base "L" Q623,624, 626,627 base "H"
P10 Pin7,9,10 signal, normal
Q625: 3.84V
other: 4.2V
Q623~627 emitter voltage, normal
CH4 Trig normal
3
Q616 emitter signal, normal
Q613 collector signal, normal
Q615,616
Q613 base signal, normal
Q613
CH4 VERTICAL
Q624 base "L" Q623,625~627 base "H"
Q624: 3.84V
other: 4.2V

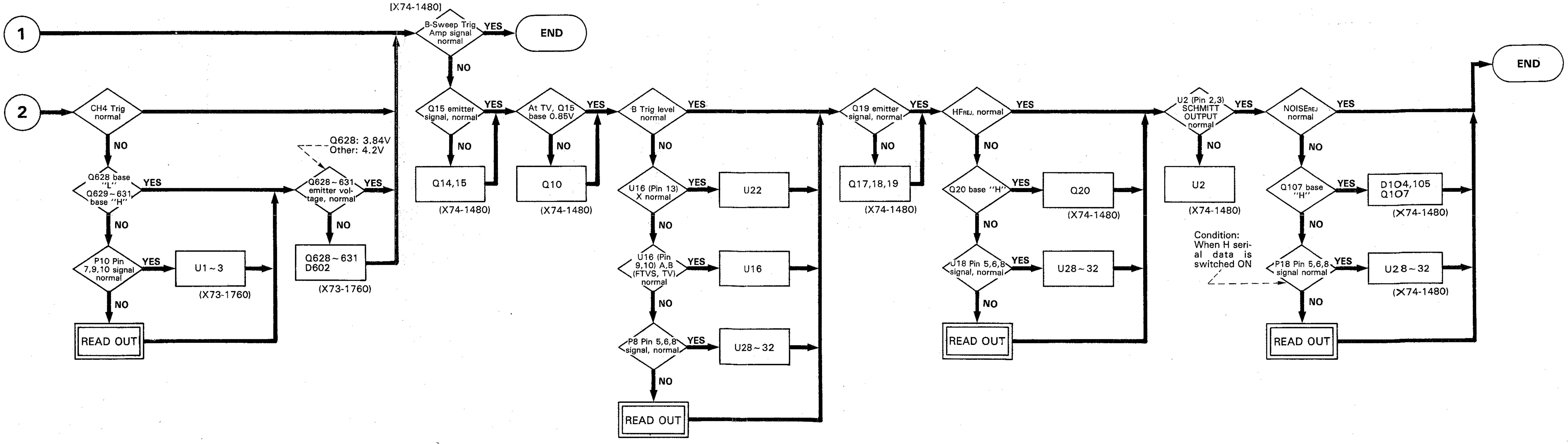
TROUBLESHOOTING



1
(X74-1480)
U1 Pin2,3 signal, normal
YES
END
(X74-1480)
NO
3
Line Trig normal
YES
NO
Q623: 3.84V
other: 4.2V
Q619 emitter signal, normal
YES
Q623 base "L" Q624~627 base "H"
YES
Q623~627 emitter voltage, normal
YES
NO
Q619
NO
P10 Pin7,9,10 signal, normal
YES
U1~3
(X73-1760)
NO
Q623~627 D601,603
(X73-1760)
NO
READ OUT
Q2 emitter signal, normal
YES
At TV Q2 base 0.85V
YES
A Trig level normal
YES
NO
Q1,2
(X74-1480)
NO
Q4,9
(X74-1480)
NO
U16 (Pin3) Y normal
YES
U21
(X74-1480)
NO
U16 (Pin9,10) A,B (FTVS, TV) normal
YES
U16
(X74-1480)
NO
P18 Pin5,6,8 signal, normal
YES
U28~32
(X74-1480)
NO
READ OUT
Q7 emitter signal, normal
YES
NO
Q5,6,7
(X74-1480)
HFREJ normal
YES
NO
Q8 base "H"
YES
Q8
(X74-1480)
NO
P18 Pin5,6,8 signal, normal
YES
U28~32
(X74-1480)
NO
READ OUT
U1, (Pin2,3) schmitt output normal
YES
4
NO
U1
(X74-1480)
4
NOISE REJ normal
YES
END
NO
Q101 base "H"
YES
D101,102 Q101
(X74-1480)
NO
P18, Pin5,6,8 signal, normal
YES
U28~32
(X74-1480)
READ OUT

TROUBLESHOOTING


B TRIG
A TRIG, normal
A TRIG
[X73-1760]
All signals of source, normal
YES
NO
1
CH1 Trig normal
NO
Q631 base "L" Q628~630 base "H"
YES
Condition: When vertical serial data is switched ON
NO
P10 Pin 7,9,10 signal normal
YES
U1~3
(X73-1760)
NO
READ OUT
Q631: 3.84V
Other: 4.2V
Q628~631 emitter voltage, normal
YES
NO
Q628~631, 618, D602
(X73-1760)
P10 (Pin 20) B Trig signal normal
YES
NO
Q633
(X73-1760)
CH2 Trig normal
YES
NO
Q630 base "L" Q628,629, 631 base "H"
YES
NO
P10 Pin7,9,10 signal, normal
YES
U1~3
(X73-1760)
NO
READ OUT
Q630: 3.84V
Other: 4.2V
Q628~631 emitter voltage, normal
YES
NO
Q628~631 D602
(X73-1760)
CH3 Trig normal
2
NO
Q629 base "L" Q628,630, 631
YES
NO
P10, Pin 7,9,10 signal, normal
YES
U1~3
(X73-1760)
NO
READ OUT
Q629: 3.84V
Other: 4.2V
Q628~631 emitter voltage, normal
YES
NO
Q628~631 D602
(X73-1760)


1
[X74-1480]
B-Sweep Trig Amp signal normal
YES
END
NO
2
CH4 Trig normal
NO
Q628 base "L" Q629~631 base "H"
YES
NO
P10 Pin 7,9,10 signal normal
YES
U1~3
(X73-1760)
NO
READ OUT
Q628: 3.84V
Other: 4.2V
Q628~631 emitter voltage, normal
YES
NO
Q628~631 D602
(X73-1760)
Q15 emitter signal, normal
YES
NO
Q14,15
(X74-1480)
At TV, Q15 base 0.85V
YES
NO
Q10
(X74-1480)
B Trig level normal
YES
NO
U16 (Pin 13) X normal
YES
U22
NO
U16 (Pin 9,10) A,B (FTVS, TV) normal
YES
U16
NO
P8 Pin 5,6,8 signal, normal
YES
U28~32
NO
READ OUT
Q19 emitter signal, normal
YES
NO
Q17,18,19
(X74-1480)
HFREJ, normal
YES
NO
Q20 base "H"
YES
Q20
(X74-1480)
NO
U18 Pin 5,6,8 signal, normal
YES
U28~32
NO
READ OUT
U2 (Pin 2,3) SCHMITT OUTPUT normal
YES
NO
U2
(X74-1480)
Condition: When H serial data is switched ON
NOISEREJ normal
YES
END
NO
Q107 base "H"
YES
D104,105 Q107
(X74-1480)
NO
P18 Pin 5,6,8 signal normal
YES
U28~32
(X74-1480)
NO
READ OUT

TROUBLESHOOTING

ATT Unit Serial Data Active Level

ATT Code (CH1 and CH2)

	1/2* U3 Pin6 (U3 Pin3)	1/4* U3 Pin5 (U3 Pin2)	1/10 U1 Pin6 (U1 Pin2)	1/100 U1 Pin7 (U1 Pin3)	MAG* U3 Pin7 (U3 Pin4)	CH1 (CH2) Display
1 mV	L	L	L	L	L	1 mV
2 mV	H	L	L	L	L	2 mV
5 mV	L	L	L	L	H	5 mV
10 mV	H	L	L	L	H	10 mV
20 mV	L	H	L	L	H	20 mV
50 mV	L	L	H	L	H	50 mV
0.1 V	H	L	H	L	H	0.1 V
0.2 V	L	H	H	L	H	0.2 V
0.5 V	L	L	L	H	H	0.5 V
1 V	H	L	L	H	H	1 V
2 V	L	H	L	H	H	2 V
5 V	L	L	H	H	H	5 V

(   ) CH2
*1/2, 1/4, MAG Signal Vertical Unit IC.

ATT Code (CH3 and CH4)

	CH3 U2 Pin1	CH4 U2 Pin2	Display
0.1V	H	H	0.1
0.5V	L	L	0.5

CH1,CH2 Coupling	Active	Output IC	Display
CH1 AC	L	U1 Pin4	mV or Ṽ
CH1 GND	L	U1 Pin5	⏚
CH2 AC	L	U1 Pin15	mV or Ṽ
CH2 GND	L	U1 Pin1	⏚

CH2 Polarity	U2 Pin3	Display
Normal	H	space
Invert	L	

Vertical Unit Serial Data Active Level

A-Source	Active	Output IC
CH1	L	U2 Pin 4
CH2	L	U2 Pin 3
CH3	L	U2 Pin 2
CH4	L	U2 Pin 1
LINE	L	U2 Pin 15

B-Source	Active	Output IC
CH1	L	U1 Pin 2
CH2	L	U1 Pin 1
CH3	L	U1 Pin 15
CH4	L	U2 Pin 5

V-Mode	Active	Output IC
CH1E	L	U1 Pin 7
CH2E	L	U1 Pin 6
CH3E	L	U1 Pin 5
CH4E	L	U1 Pin 4
ADDE	L	U1 Pin 3

20MHz BWL	Active	Output IC	Display
BW	L	U3 Pin 1	Bw

Horizontal Unit Serial Data Active Level

(A-Coupling)	Active	Output IC	Condition
AC	L	U29 Pin 7	A Coupling"AC" or A-Source "LINE"
NOISE$_{REJ}$	H	U29 Pin 5	A-Coupling "NOISE$_{REJ}$"
HF$_{REJ}$	H	U29 Pin 6	A-Coupling "HF$_{REJ}$" or "TV-V" or A-Source "LINE"
TV	H	U29 Pin 4	A-Coupling "TV-V" or "TV-H"
(B-Coupling)			
AC	L	U29 Pin 15	B-Coupling "AC"
NOISE$_{REJ}$	H	U29 Pin 2	B-Coupling "NOISE$_{REJ}$"
HF$_{REJ}$	H	U29 Pin 1	B-Coupling "HF$_{REJ}$"
FTVS	H	U29 Pin 3	A-Coupling "TV-V" "TV-H" and Slope "–" or "FIX"

ASLOPE	U30 Pin 7
+	H
–	L

B SLOPE	U30 Pin 6
+	H
–	L

SWEEP MODE	U30 Pin 5	Condition
NORMAL	L	Non "AUTO" or "X-Y"

HORIZONTAL MODE	Active	Output IC	Condition	Display
A	L	U32 Pin 6	Horizontal Mode "A"	A Sweep Time
ALT	L	U32 Pin 1	Horizontal Mode "ALT"	A, B Sweep Time
B	L	U32 Pin 3	Horizontal Mode "B"	A, B Sweep Time
X, Y	L	U28 Pin 7	Horizontal Mode "X, Y"	"CH2-X"
X-Y SGL	H	U32 Pin 4	Horizontal Mode "X-Y" and single sweep	

MAG	U32 Pin 2	Condition
normal	H	Horizontal Mode "A INT B" or "X-Y" or MAG normal
X10 MAG	L	

Single Sweep	Active	Output IC
Single	L	U30 Pin 2

CHOP	Active	Output IC
CHOP	L	U30 Pin 15

B (TV)	A (FTVS)	Y	X
0	0	Y0 (ALVL)	Y0 (BLVL)
0	1	Y1 (FIX)	X1 (BLVL) (X0=X1)
1	0	Y2 (TV+)	X2 (TV+)
1	1	Y3 (TV–)	X3 (TV–)

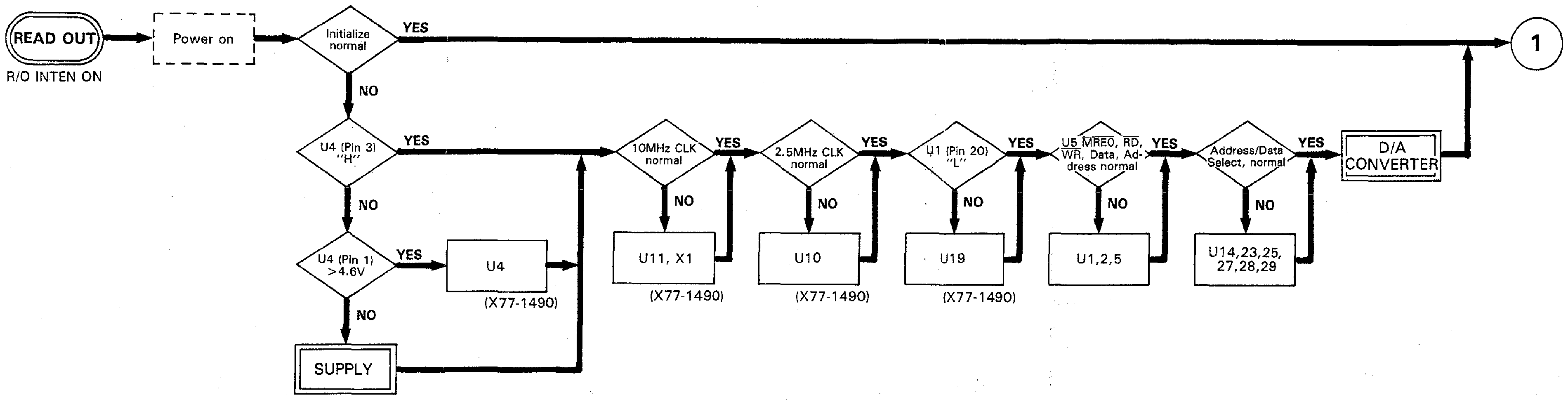
X74-1480
U16 Analog SW Control signal

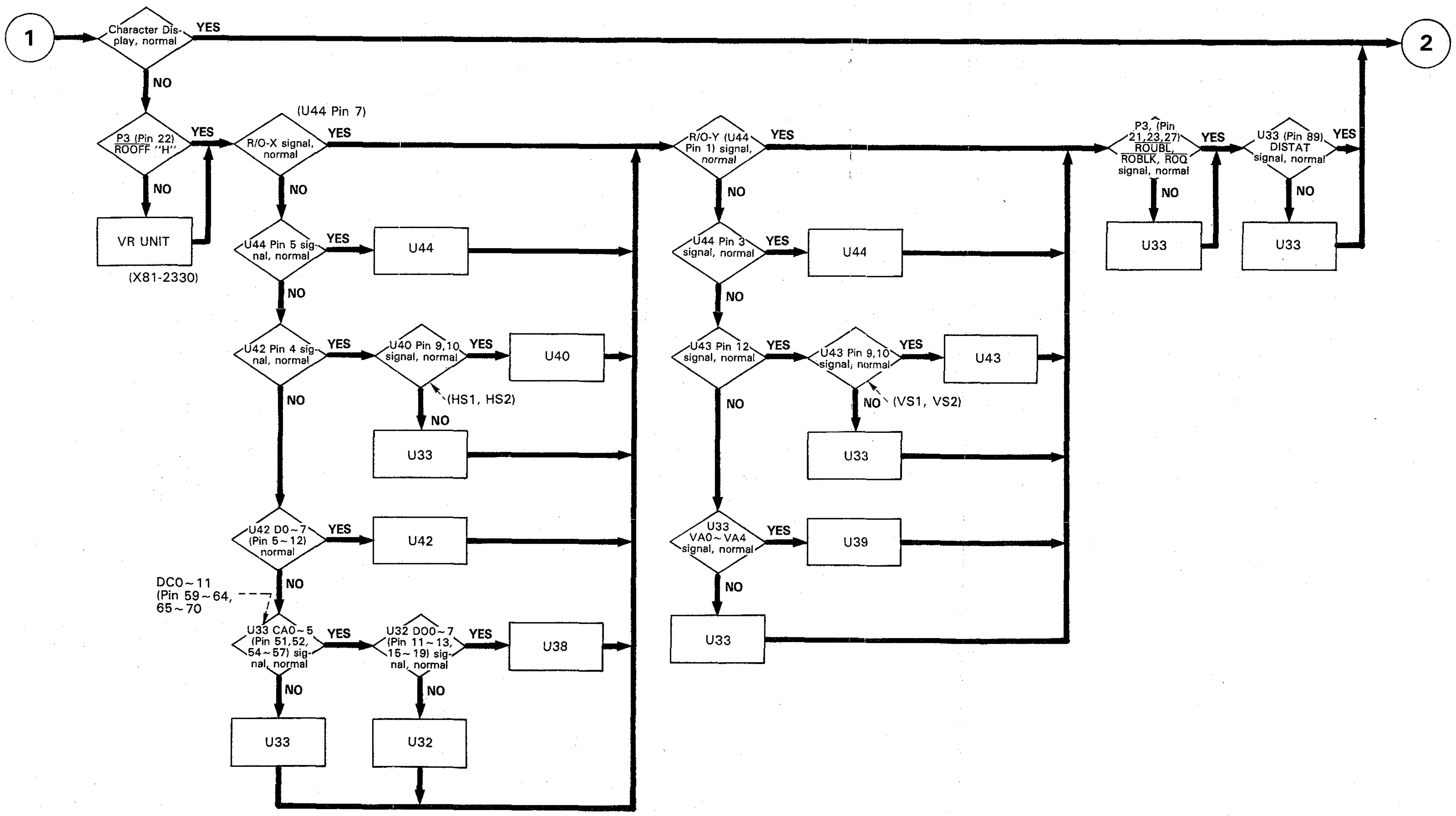
TV...TV-V or TV-H "H" other "L"
FTVS...Fix or TV SLOPE ⊖ "H" other "L"

SWEEP TIME CODE

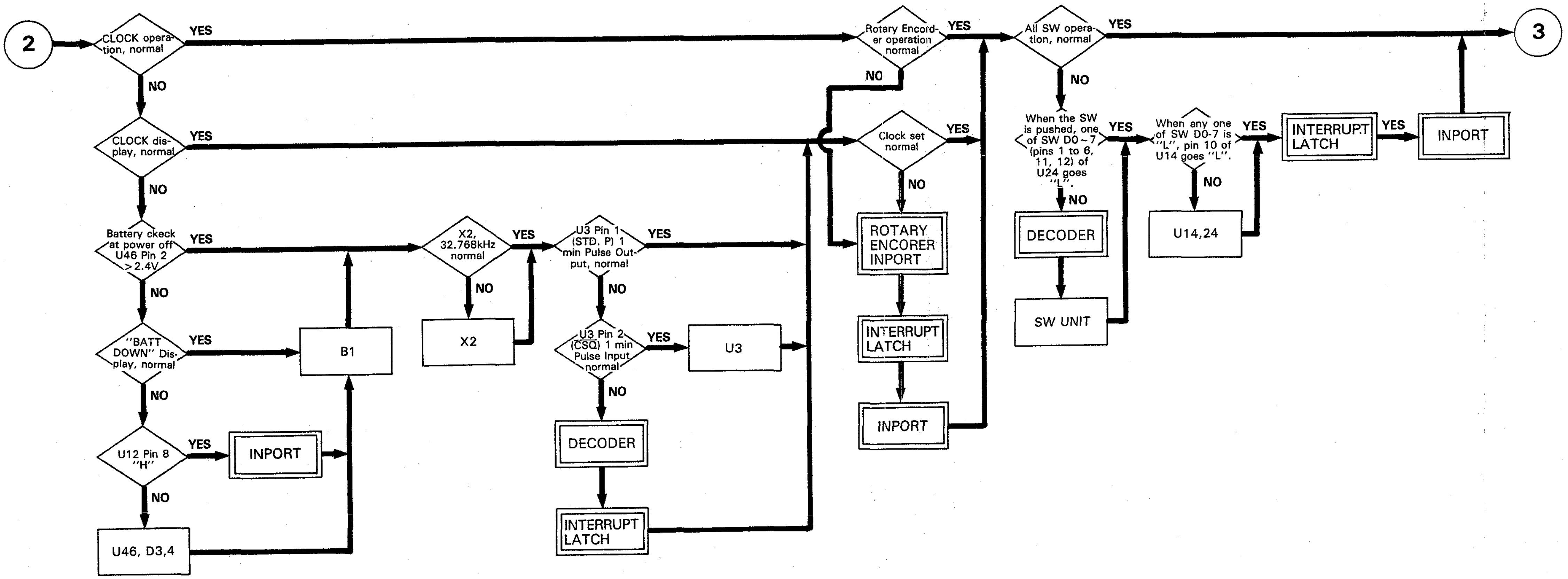
	A Sweep Time Code			B Sweep Time Code		
Sweep Time	AS-A	AS-B	AS-C	BS-A	BS-B	BS-C
0.5s	0	0	0			
0.2s	0	0	0			
0.1s	0	0	0			
50ms	1	0	0	1	0	0
20ms	1	0	0	1	0	0
10ms	1	0	0	1	0	0
5ms	0	1	0	0	1	0
2ms	0	1	0	0	1	0
1ms	0	1	0	0	1	0
0.5ms	1	1	0	1	1	0
0.2ms	1	1	0	1	1	0
0.1ms	1	1	0	1	1	0
50μs	0	0	1	0	0	1
20μs	0	0	1	0	0	1
10μs	0	0	1	0	0	1
5μs	1	0	1	1	0	1
2μs	1	0	1	1	0	1
1μs	1	0	1	1	0	1
0.5μs	0	1	1	0	1	1
0.2μs	0	1	1	0	1	1
0.1μs	0	1	1	0	1	1
50ns	1	1	1	1	1	1
20ns	1	1	1	1	1	1

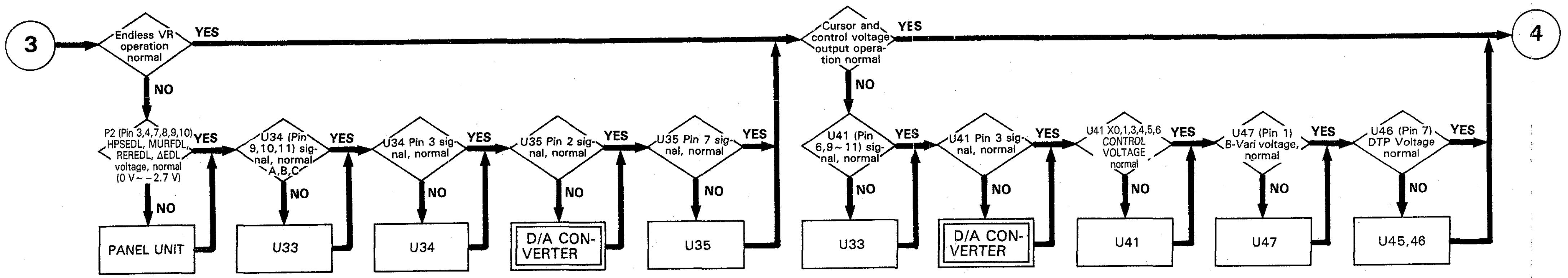
TROUBLESHOOTING

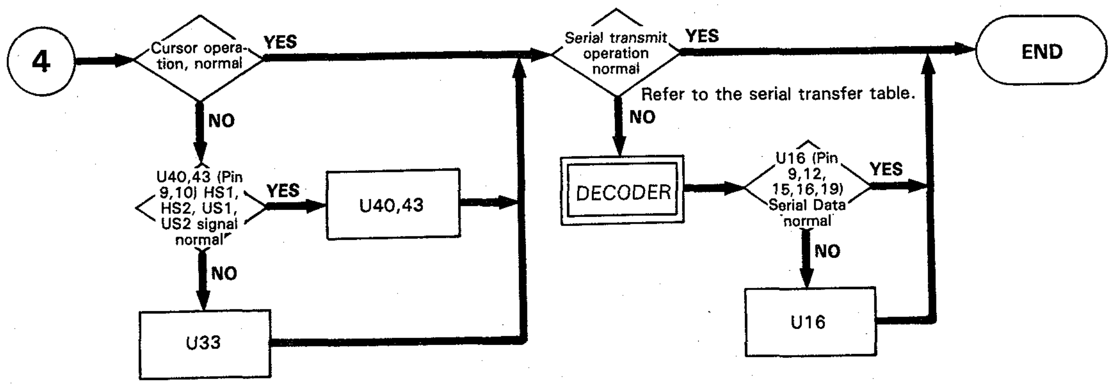

READ OUT
R/O INTEN ON
Power on
Initialize normal
YES
NO
1
U4 (Pin 3) "H"
YES
NO
U4 (Pin 1) >4.6V
YES
NO
U4
(X77-1490)
SUPPLY
10MHz CLK normal
YES
NO
U11, X1
(X77-1490)
2.5MHz CLK normal
YES
NO
U10
(X77-1490)
U1 (Pin 20) "L"
YES
NO
U19
(X77-1490)
U5 MREO, RD, WR, Data, Address normal
YES
NO
U1,2,5
Address/Data Select, normal
YES
NO
U14,23,25, 27,28,29
D/A CONVERTER


1
Character Display, normal
YES
NO
2
P3 (Pin 22) ROOFF "H"
YES
NO
VR UNIT
(X81-2330)
(U44 Pin 7)
R/O-X signal, normal
YES
NO
U44 Pin 5 signal, normal
YES
NO
U44
U42 Pin 4 signal, normal
YES
NO
U40 Pin 9,10 signal, normal
YES
NO
(HS1, HS2)
U40
U33
U42 D0~7 (Pin 5~12) normal
YES
NO
U42
DC0~11 (Pin 59~64, 65~70
U33 CA0~5 (Pin 51,52, 54~57) signal, normal
YES
NO
U33
U32 DO0~7 (Pin 11~13, 15~19) signal, normal
YES
NO
U38
U32
R/O-Y (U44 Pin 1) signal, normal
YES
NO
U44 Pin 3 signal, normal
YES
NO
U44
U43 Pin 12 signal, normal
YES
NO
U43 Pin 9,10 signal, normal
YES
NO
(VS1, VS2)
U43
U33
U33 VA0~VA4 signal, normal
YES
NO
U39
U33
P3, (Pin 21,23,27) ROUBL, ROBLK, ROQ signal, normal
YES
NO
U33
U33 (Pin 89) DISTAT signal, normal
YES
NO
U33

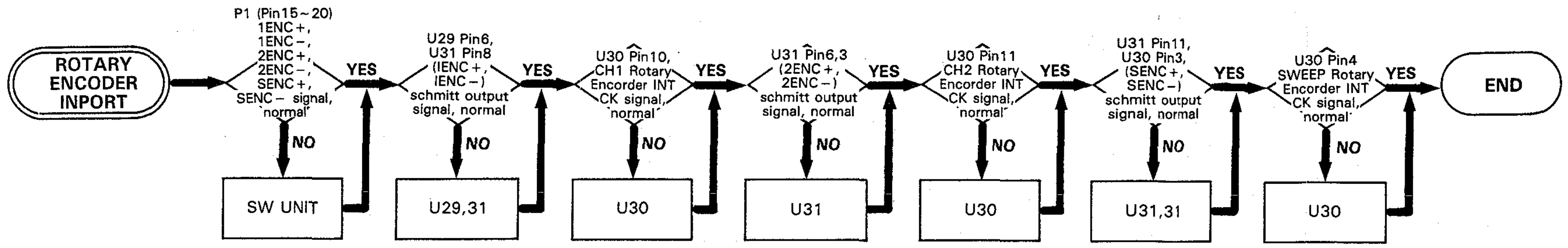
TROUBLESHOOTING

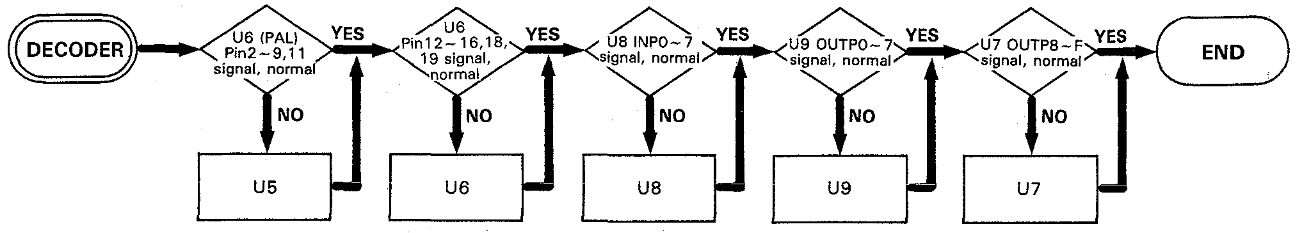

2
CLOCK operation, normal
YES
NO
CLOCK display, normal
YES
NO
Battery ckeck at power off U46 Pin 2 > 2.4V
YES
NO
"BATT DOWN" Display, normal
YES
NO
U12 Pin 8 "H"
YES
NO
INPORT
U46, D3,4
B1
X2, 32.768kHz normal
YES
NO
X2
U3 Pin 1 (STD. P) 1 min Pulse Output, normal
YES
NO
U3 Pin 2 (CSQ) 1 min Pulse Input normal
YES
NO
U3
DECODER
INTERRUPT LATCH
Rotary Encorder operation normal
YES
NO
Clock set normal
YES
NO
ROTARY ENCORER INPORT
INTERRUPT LATCH
INPORT
All SW operation, normal
YES
NO
When the SW is pushed, one of SW D0~7 (pins 1 to 6, 11, 12) of U24 goes "L".
YES
NO
DECODER
SW UNIT
When any one of SW D0-7 is "L", pin 10 of U14 goes "L".
YES
NO
U14,24
INTERRUPT LATCH
YES
INPORT
3

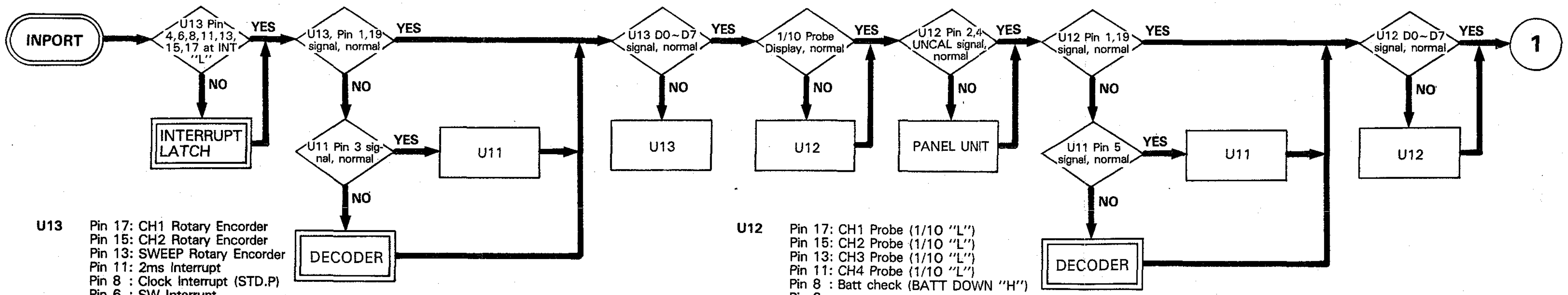

3
Endless VR operation normal
YES
NO
P2 (Pin 3,4,7,8,9,10) HPSEDL, MURFDL, REREDL, ΔEDL voltage, normal (0 V~ –2.7 V)
YES
NO
PANEL UNIT
U34 (Pin 9,10,11) signal, normal A,B,C
YES
NO
U33
U34 Pin 3 signal, normal
YES
NO
U34
U35 Pin 2 signal, normal
YES
NO
D/A CONVERTER
U35 Pin 7 signal, normal
YES
NO
U35
Cursor and control voltage output operation normal
YES
NO
U41 (Pin 6,9~11) signal, normal
YES
NO
U33
U41 Pin 3 signal, normal
YES
NO
D/A CONVERTER
U41 X0,1,3,4,5,6 CONTROL VOLTAGE normal
YES
NO
U41
U47 (Pin 1) B-Vari voltage, normal
YES
NO
U47
U46 (Pin 7) DTP Voltage normal
YES
NO
U45,46
4


4
Cursor operation, normal
YES
NO
U40,43 (Pin 9,10) HS1, HS2, US1, US2 signal normal
YES
NO
U40,43
U33
Serial transmit operation normal
YES
Refer to the serial transfer table.
NO
DECODER
U16 (Pin 9,12, 15,16,19) Serial Data normal
YES
NO
U16
END

TROUBLESHOOTING


ROTARY ENCODER INPORT
P1 (Pin15~20) 1ENC+, 1ENC−, 2ENC+, 2ENC−, SENC+, SENC− signal, normal
YES
NO
SW UNIT
U29 Pin6, U31 Pin8 (IENC+, IENC−) schmitt output signal, normal
U29,31
U30 Pin10, CH1 Rotary Encorder INT CK signal, normal
U30
U31 Pin6,3 (2ENC+, 2ENC−) schmitt output signal, normal
U31
U30 Pin11 CH2 Rotary Encorder INT CK signal, normal
U30
U31 Pin11, U30 Pin3, (SENC+, SENC−) schmitt output signal, normal
U31,31
U30 Pin4 SWEEP Rotary Encorder INT CK signal, normal
U30
END

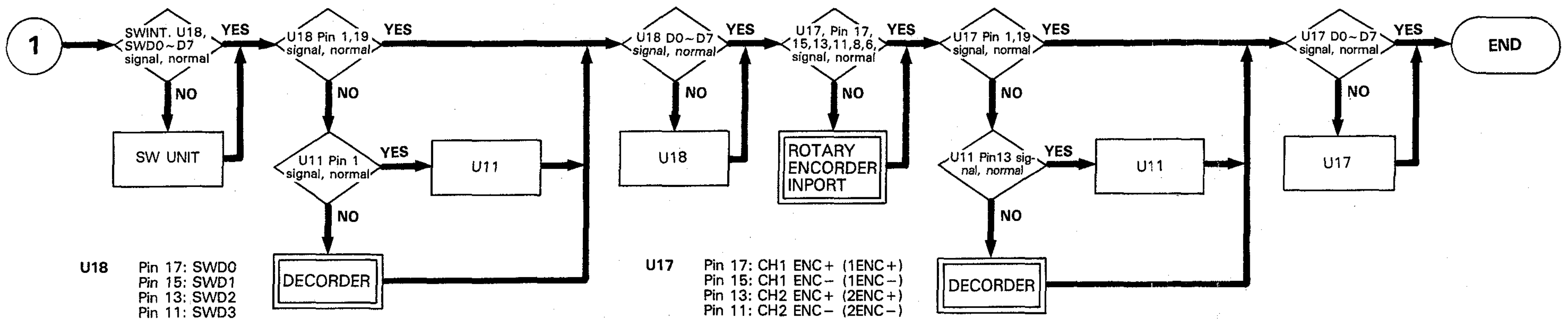

DECODER
U6 (PAL) Pin2~9,11 signal, normal
YES
NO
U5
U6 Pin12~16,18, 19 signal, normal
U6
U8 INP0~7 signal, normal
U8
U9 OUTP0~7 signal, normal
U9
U7 OUTP8~F signal, normal
U7
END


INPORT
U13 Pin 4,6,8,11,13, 15,17 at INT "L"
YES
NO
INTERRUPT LATCH
U13, Pin 1,19 signal, normal
U11 Pin 3 signal, normal
U11
DECODER
U13 D0~D7 signal, normal
U13
1/10 Probe Display, normal
U12
U12 Pin 2,4 UNCAL signal, normal
PANEL UNIT
U12 Pin 1,19 signal, normal
U11 Pin 5 signal, normal
U11
DECODER
U12 D0~D7 signal, normal
U12
1

U13
Pin 17: CH1 Rotary Encorder
Pin 15: CH2 Rotary Encorder
Pin 13: SWEEP Rotary Encorder
Pin 11: 2ms Interrupt
Pin 8 : Clock Interrupt (STD.P)
Pin 6 : SW Interrupt
Pin 4 : DISTAT
Pin 2 : "L" (always)

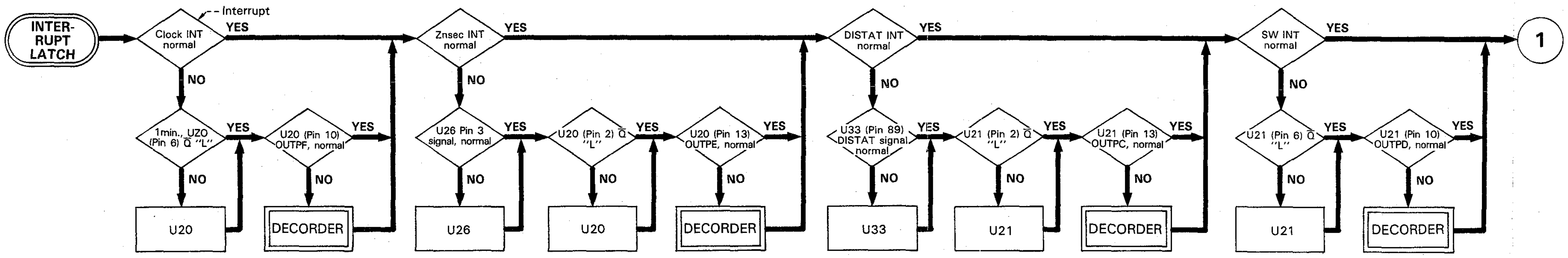
U12
Pin 17: CH1 Probe (1/10 "L")
Pin 15: CH2 Probe (1/10 "L")
Pin 13: CH3 Probe (1/10 "L")
Pin 11: CH4 Probe (1/10 "L")
Pin 8 : Batt check (BATT DOWN "H")
Pin 6 :
Pin 4 : CH1 UNCAL (UNCAL "H")
Pin 2 : CH2 UNCAL (UNCAL "H")

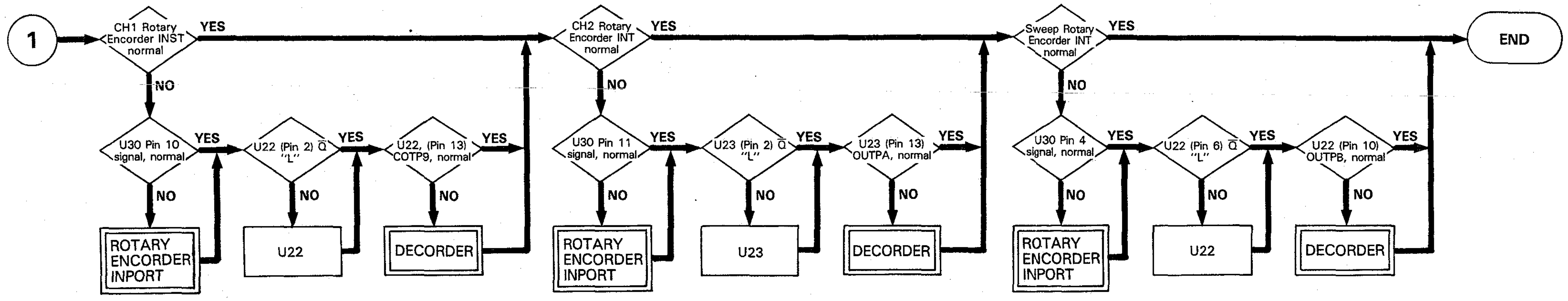
TROUBLESHOOTING


1
SWINT. U18, SWD0~D7 signal, normal
YES
NO
SW UNIT
U18 Pin 1,19 signal, normal
YES
NO
U11 Pin 1 signal, normal
YES
U11
NO
DECORDER
U18 D0~D7 signal, normal
YES
NO
U18
U17, Pin 17, 15,13,11,8,6, signal, normal
YES
NO
ROTARY ENCORDER INPORT
U17 Pin 1,19 signal, normal
YES
NO
U11 Pin13 signal, normal
YES
U11
NO
DECORDER
U17 D0~D7 signal, normal
YES
NO
U17
END

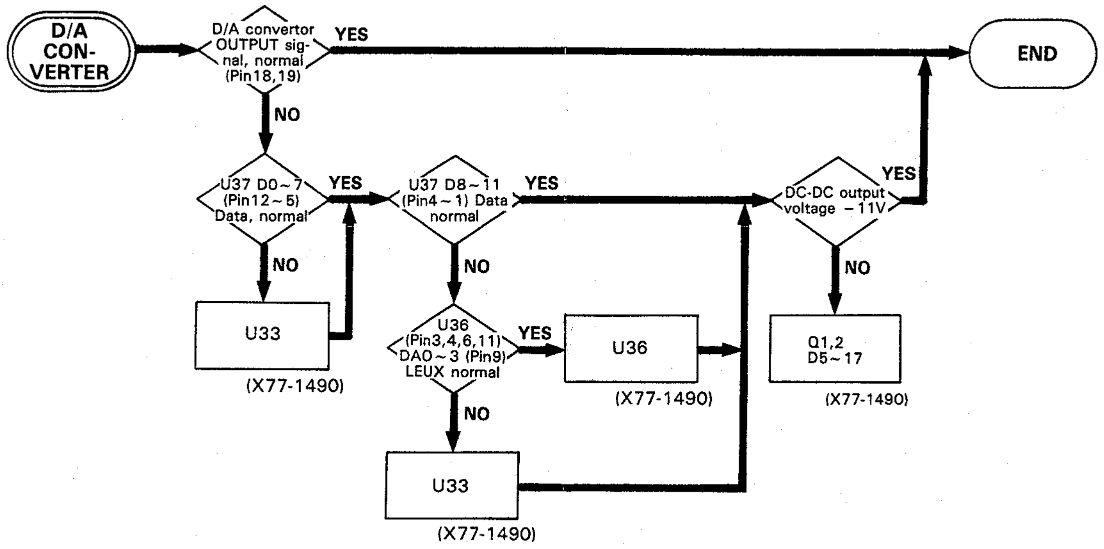
U18
Pin 17: SWD0
Pin 15: SWD1
Pin 13: SWD2
Pin 11: SWD3
Pin 8 : SWD4
Pin 6 : SWD5
Pin 4 : SWD6
Pin 2 : SWD7

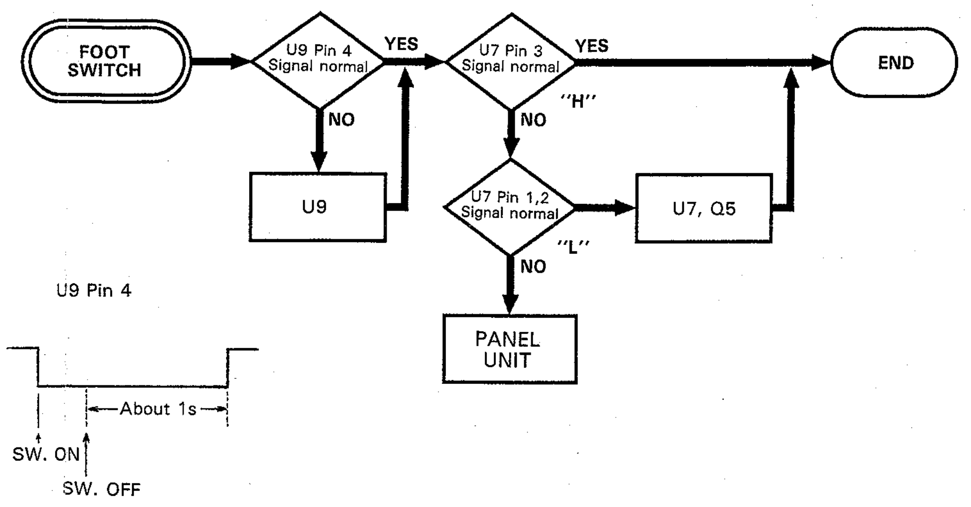
U17
Pin 17: CH1 ENC+ (1ENC+)
Pin 15: CH1 ENC− (1ENC−)
Pin 13: CH2 ENC+ (2ENC+)
Pin 11: CH2 ENC− (2ENC−)
Pin 8 : SWEEP ENC+ (SENC+)
Pin 6 : SWEEP ENC− (SENC−)
Pin 4 : ENDLESS DR MOVE CHECK
Pin 2 : Ready LED ON/OFF CHECK

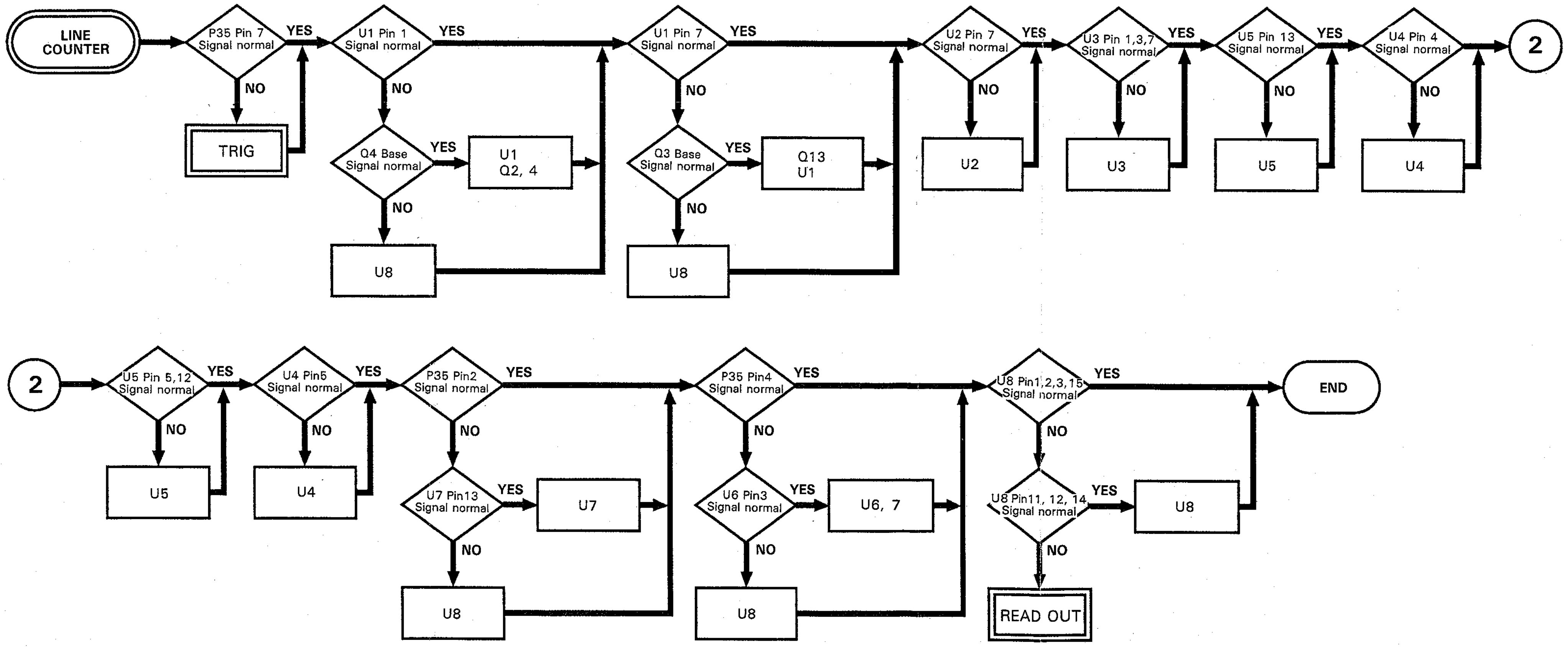

INTER-RUPT LATCH
Interrupt
Clock INT normal
YES
NO
1min., UZO (Pin 6) $\overline{Q}$ "L"
YES
NO
U20
U20 (Pin 10) OUTPF, normal
YES
NO
DECORDER
Znsec INT normal
YES
NO
U26 Pin 3 signal, normal
YES
NO
U26
U20 (Pin 2) $\overline{Q}$ "L"
YES
NO
U20
U20 (Pin 13) OUTPE, normal
YES
NO
DECORDER
DISTAT INT normal
YES
NO
U33 (Pin 89) DISTAT signal normal
YES
NO
U33
U21 (Pin 2) $\overline{Q}$ "L"
YES
NO
U21
U21 (Pin 13) OUTPC, normal
YES
NO
DECORDER
SW INT normal
YES
NO
U21 (Pin 6) $\overline{Q}$ "L"
YES
NO
U21
U21 (Pin 10) OUTPD, normal
YES
NO
DECORDER
1


1
CH1 Rotary Encorder INST normal
YES
NO
U30 Pin 10 signal, normal
YES
NO
ROTARY ENCORDER INPORT
U22 (Pin 2) $\overline{Q}$ "L"
YES
NO
U22
U22, (Pin 13) COTP9, normal
YES
NO
DECORDER
CH2 Rotary Encorder INT normal
YES
NO
U30 Pin 11 signal, normal
YES
NO
ROTARY ENCORDER INPORT
U23 (Pin 2) $\overline{Q}$ "L"
YES
NO
U23
U23 (Pin 13) OUTPA, normal
YES
NO
DECORDER
Sweep Rotary Encorder INT normal
YES
NO
U30 Pin 4 signal, normal
YES
NO
ROTARY ENCORDER INPORT
U22 (Pin 6) $\overline{Q}$ "L"
YES
NO
U22
U22 (Pin 10) OUTPB, normal
YES
NO
DECORDER
END

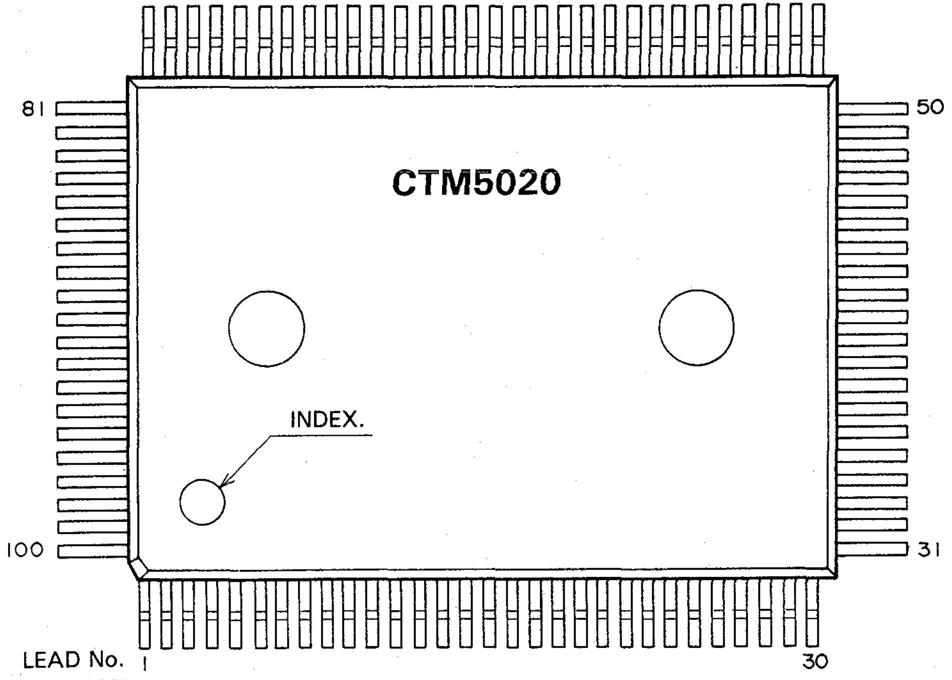
TROUBLESHOOTING


D/A CON-VERTER
D/A convertor OUTPUT signal, normal (Pin18,19)
YES
NO
END
U37 D0~7 (Pin12~5) Data, normal
YES
NO
U33
(X77-1490)
U37 D8~11 (Pin4~1) Data normal
YES
NO
U36 (Pin3,4,6,11) DA0~3 (Pin9) LEUX normal
YES
NO
U36
(X77-1490)
U33
(X77-1490)
DC-DC output voltage -11V
YES
NO
Q1,2 D5~17
(X77-1490)


FOOT SWITCH
U9 Pin 4 Signal normal
YES
NO
U9
U7 Pin 3 Signal normal
YES
"H"
NO
END
U7 Pin 1,2 Signal normal
U7, Q5
"L"
NO
PANEL UNIT
U9 Pin 4
About 1s
SW. ON
SW. OFF


LINE COUNTER
P35 Pin 7 Signal normal
YES
NO
TRIG
U1 Pin 1 Signal normal
YES
NO
Q4 Base Signal normal
YES
NO
U1 Q2, 4
U8
U1 Pin 7 Signal normal
YES
NO
Q3 Base Signal normal
YES
NO
Q13 U1
U8
U2 Pin 7 Signal normal
YES
NO
U2
U3 Pin 1,3,7 Signal normal
YES
NO
U3
U5 Pin 13 Signal normal
YES
NO
U5
U4 Pin 4 Signal normal
YES
NO
U4
2
2
U5 Pin 5,12 Signal normal
YES
NO
U5
U4 Pin5 Signal normal
YES
NO
U4
P35 Pin2 Signal normal
YES
NO
U7 Pin13 Signal normal
YES
NO
U7
U8
P35 Pin4 Signal normal
YES
NO
U6 Pin3 Signal normal
YES
NO
U6, 7
U8
U8 Pin1,2,3,15 Signal normal
YES
NO
U8 Pin11, 12, 14 Signal normal
YES
NO
U8
READ OUT
END

CTM5020 PIN ASSIGNMENT (100-pin FPT) (with RAM)

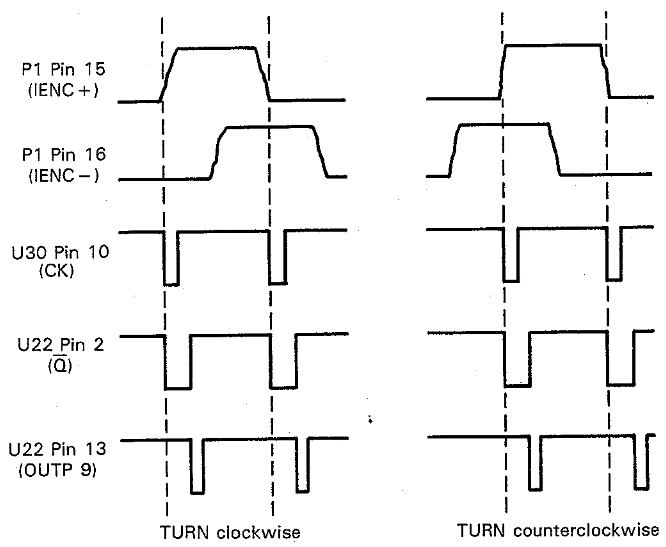


CTM5020 PIN DESCRIPTION

Pin No.	I/O	Pin Name	Function
1	I	CONT	Selection between X-Y mode and normal mode
2	I	A13	Address bus A13
3	–	VDD	+5 V power supply
4	I	A14	Address bus A14
5	I	A15	Address bus A15
6	O	INT0	1/2 period of ROSF signal (Open pin)
7	O	VX3	Selection signal of analog switch to input the endless VR voltage
8	O	VX2	Selection signal of analog switch to input the endless VR voltage
9	O	VX1	Selection signal of analog switch to input the endless VR voltage
10	O	VX0	Selection signal of analog switch to input the endless VR voltage
11	O	DA0	Outport (8004H) D0 D/A data (LSB or D8)
12	O	DA1	Outport (8004H) D1 D/A data (D1 or D9)
13	O	DA2	Outport (8004H) D2 D/A data (D2 or D10)
14	O	DA3	Outport (8004H) D3 D/A data (D3 or MSB)
15	–	VSS	GND
16	O	DA4	Outport (8004H) D4 D/A data (D4)
17	O	DA5	Outport (8004H) D5 D/A data (D5)
18	O	DA6	Outport (8004H) D6 D/A data (D6)
19	O	DA7	Outport (8004H) D7 D/A data (D7)
20	O	DA8	Outport (8005H) D0 (Open pin)
21	O	DA9	Outport (8005H) D1 (Serial blanking control signal)
22	O	ROR	Readout monitor terminal
23	I	ROA	Readout monitor terminal
24	O	LEVX	Outport (8005H) D7 D/A Data D8~MSB Latch signal
25	I	TCL	Test pin (UDD)
26	I	TSD0	Test pin (GND)
27	I	TSD1	Test pin (GND)
28	–	VDD	+5 V power supply
29	I	TSD2	Test pin (GND)
30	O	AX2	Selection signal of analog switch to output the cursor, H Variable, Delay Position, H Position voltage
31	O	AX1	Selection signal of analog switch to output the cursor H variable, Delay Position, H Position voltage
32	O	AX0	Selection signal of analog switch to output the cursor H variable, Delay Position, H position voltage
33	O	AX3	Selection signal of analog switch to output the cursor H variable, Delay Position, H Position voltage
34	O	HS2	Selection signal of analog switch for the readout X-axis signal
35	O	HS1	Selection signal of analog switch for the readout X-axis signal
36	O	TDIO	Test pin (VDD)
37	I	TWE	Test pin (VDD)
38	I	TCK1	Test pin (VDD)
39	I	TST1	Test pin (VDD)
40	–	VSS	GND
41	I	TST2	Test pin (VDD)
42	I	TADD	Test pin (VDD)
43	I	TCK2	Test pin (VDD)
44	O	VS2	Selection signal of analog switch for the readout Y-axis signal
45	O	VS1	Selection signal of analog switch for the readout Y-axis signal
46	O	VA0	Character Y-axis DAC data
47	O	VA4	Character Y-axis DAC data
48	O	VA3	Character Y-axis DAC data
49	O	VA2	Character Y-axis DAC data
50	O	VA1	Character Y-axis DAC data
51	O	GETD	Character X-axis data latch clock
52	O	CA0	Character counter data
53	–	VDD	+5 V power supply
54	O	CA4	Character counter data
55	O	CA3	Character counter data
56	O	CA2	Character counter data
57	O	CA1	Character counter data
58	O	CD3	Character ROM address
59	O	CD2	Character ROM address
60	O	CD4	Character ROM address
61	O	CD1	Character ROM address
62	O	CD5	Character ROM address
63	O	DC4	Dot counter data
64	O	CD7	Character ROM address
65	–	VSS	GND
66	O	DC3	Dot counter data
67	O	DC2	Dot counter data
68	O	CD6	Character ROM address
69	O	DC1	Dot counter data
70	O	DC0	Dot counter data
71	O	CD0	Character ROM address (Open pin)
72	I	D07	Character ROM Y-axis DAC data
73	I	D06	Character ROM Y-axis DAC data
74	I	D05	Character ROM Y-axis DAC data
75	I	D04	Character ROM Y-axis DAC data
76	I	D03	Character ROM Y-axis DAC data
77	I	SING	Terminal for SINGLE signal
78	–	VDD	+5 V power supply
79	I	R10M	10 MHz clock
80	I	10M	10 MHz clock
81	I	HLDF	Holdoff input
82	I	SGA	Sweep gate
83	I	ROSP	Readout off
84	I	ROD	Character counter reset
85	O	HLDL	Holdoff output
86	O	ROUB	Readout unblanking
87	O	ROB	Readout blanking
88	O	ROQ	Readout request
89	O	ROED	Readout end
90	–	VSS	GND
91	I	D7	Data bus D7
92	I	D5	Data bus D5
93	I	D3	Data bus D3
94	I	D1	Data bus D1
95	I	ALE	Address/Data latch
96	I	D6	Data bus D6
97	I	D4	Data bus D4
98	I	D2	Data bus D2
99	I	D0	Data bus D0
100	I	WR	Write timing signal

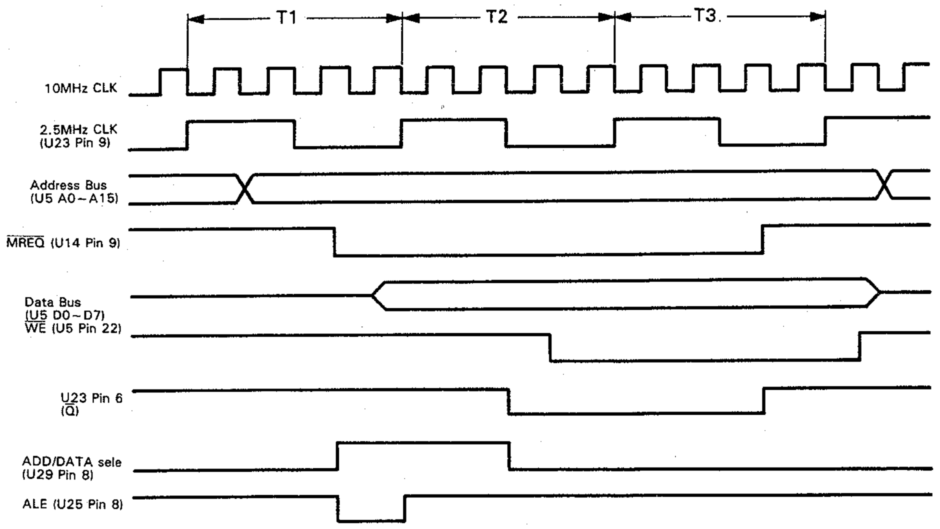
TROUBLESHOOTING

Rotary Encoder Timing chart (X77-1490-01)

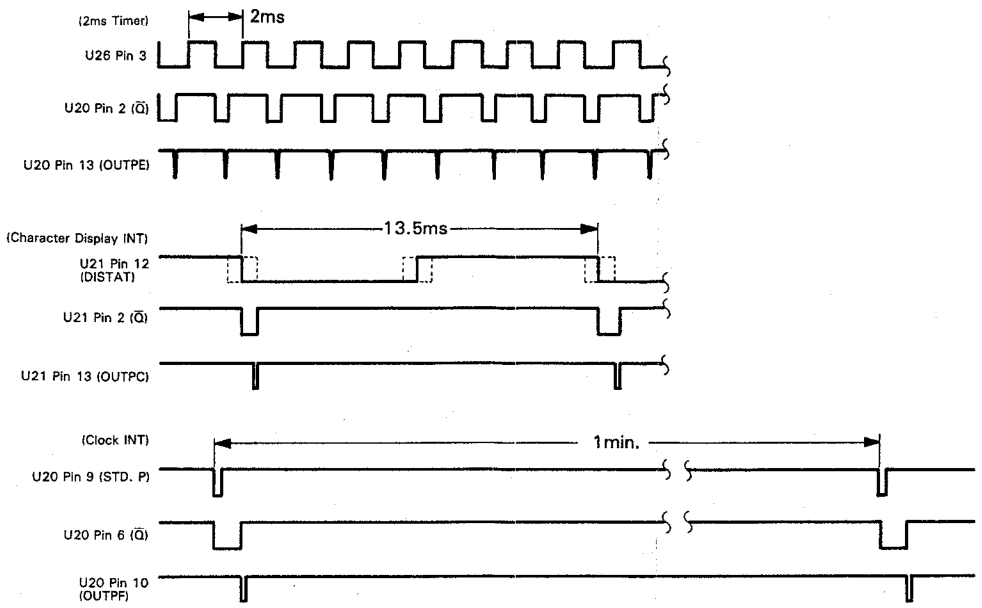

P1 Pin 15
(IENC+)
P1 Pin 16
(IENC−)
U30 Pin 10
(CK)
U22 Pin 2
(Q̄)
U22 Pin 13
(OUTP 9)
TURN clockwise
TURN counterclockwise

The timing charts of the CH2 rotary encoder and sweep rotary encoder are also the same.

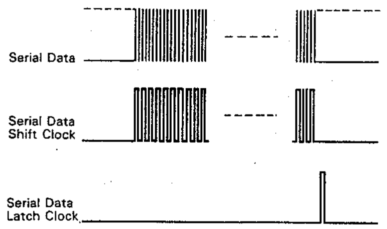
Address/Data Select Timing Chart (X77-1490-01)


T1
T2
T3.
10MHz CLK
2.5MHz CLK
(U23 Pin 9)
Address Bus
(U5 A0~A15)
MREQ (U14 Pin 9)
Data Bus
(U5 D0~D7)
WE (U5 Pin 22)
U23 Pin 6
(Q̄)
ADD/DATA sele
(U29 Pin 8)
ALE (U25 Pin 8)

Interrupt Timing Chart


(2ms Timer)
2ms
U26 Pin 3
U20 Pin 2 (Q̄)
U20 Pin 13 (OUTPE)
(Character Display INT)
13.5ms
U21 Pin 12
(DISTAT)
U21 Pin 2 (Q̄)
U21 Pin 13 (OUTPC)
(Clock INT)
1min.
U20 Pin 9 (STD. P)
U20 Pin 6 (Q̄)
U20 Pin 10
(OUTPF)

Serial Transmit Timing Chart


Serial Data
Serial Data
Shift Clock
Serial Data
Latch Clock

	Panel SW SCAN	Panel LED Control	ATT UNIT Control	V UNIT Control	H UNIT Control
Serial Data	P1 Pin 4 (SD)	P1 Pin 1 (LD)	P4 Pin 9 (AD)	U16 Pin 16 (VD)	U16 Pin 19 (HD)
Serial Data shift Clock	P1 Pin 5 (SSC)	P1 Pin 2 (LSC)	P4 Pin 8 (ASC)	U9 Pin 14 (VSC)	U9 Pin 10 (HSC)
Serial Data Latch clock	P1 Pin 6 (SLC)	P1 Pin 3 (LLC)	P4 Pin 7 (ALC)	U8 Pin 11 (VLC)	U8 Pin 7 (HLC)

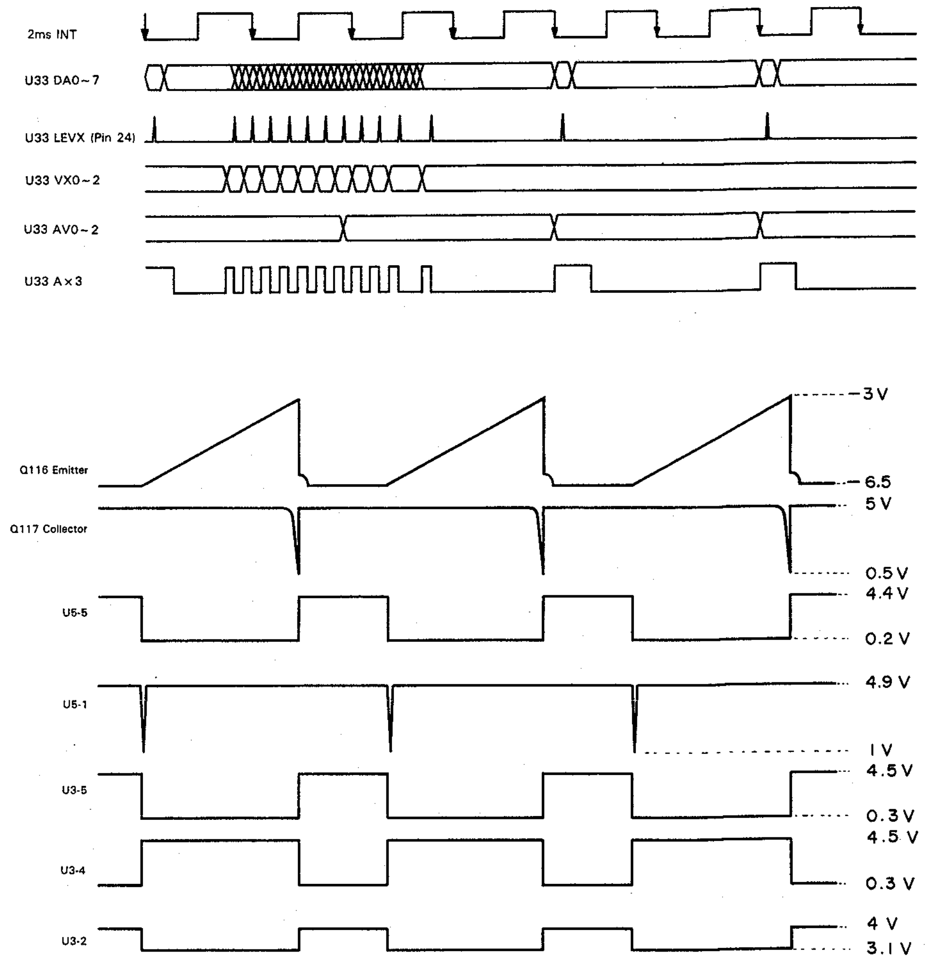
CH1 (CH2) Vertical Gain VARIABLE

V. Variable	U12 Pin 4 (2)	Display
CAL	L	Space
UNCAL	H	>

CH1～CH4 Probe

Probe	U12 Pin 17,15,13,11	Display
1/1	H	Volts/div × 1 display
1/10	L	Volts/div × 10 display

Endless VR Select and Control Timing Chart


2ms INT
U33 DA0～7
U33 LEVX (Pin 24)
U33 VX0～2
U33 AV0～2
U33 A×3
Q116 Emitter
Q117 Collector
U5-5
U5-1
U3-5
U3-4
U3-2
3 V
6.5
5 V
0.5 V
4.4 V
0.2 V
4.9 V
1 V
4.5 V
0.3 V
4.5 V
0.3 V
4 V
3.1 V

Endless VR Select

V×2	V×1	V×0	Select CH	Endless VR
L	L	L	U34 Pin 13	Δ Endless VR
L	L	H	U34 Pin 14	
L	H	L	U34 Pin 15	REF Endless VR
L	H	H	U34 Pin 12	
H	L	L	U34 Pin 1	H-Posi Endless VR
H	L	H	U34 Pin 5	
H	H	L	U34 Pin 2	H-Vari Endless VR
H	H	H	U34 Pin 4	

CONTROL Voltage Select

A×3	A×2	A×1	A×0	Select CH	Control Voltage
L	L	L	L	U41 Pin13	REF Cursor
L	L	L	H	U41 Pin 14	Δ Cursor
L	L	H	L	U41 Pin 15	A-Variable
L	L	H	H	U41 Pin 12	B-Variable
L	H	L	L	U41 Pin 1	V-Delay (DTP)
L	H	L	H	U41 Pin 5	C-Delay (DTP)
L	H	H	L	U41 Pin 2	H-Posi
L	H	H	H	U41 Pin 4*	
H	X	X	X	All off	Inhibit

* Items marked * are not selected.
X Items marked X can be either L or H.

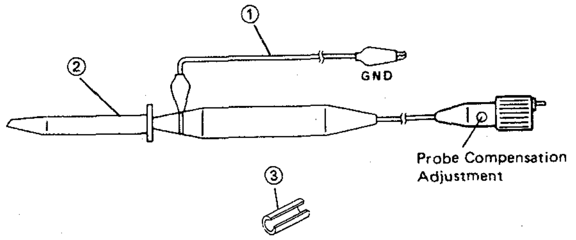
PARTS LIST

CS-6030 UNIT

Y70-1700-01

REF. NO	PARTS NO	NAME & DESCRIPTION
	A20-2834-52	PANEL ASS'Y
	B07-0703-04	ESCUTCHEON FOR ASTIG
	B30-0925-05	LAMP
	B41-0875-04	SERIAL NO. PLATE
	B50-7670-20	INSTRUCTION MANUAL,JAPANESE
	B50-7671-20	INSTRUCTION MANUAL,ENGLISH
	E23-0565-05	EARTH WASHER
	E23-0567-04	EARTH BRACKET;COPPER
	E30-1644-15	BS POWER CORD
	E30-1818-05	JIS POWER CORD SET
	E30-1819-15	CEE POWER CORD SET
	E30-1820-05	UL/CSA POWER CORD SET
	E30-1821-05	SAA POWER CORD SET
	E31-0717-25	WIRE ASS'Y;INLET TO GND
	E38-0068-05	WIRE ASS'Y;FOOT SWITCH BNC
	E38-0069-05	WIRE ASS'Y;FOOT SWITCH PANEL
	E38-0078-05	WIRE ASS'Y;EXT Z
	E38-0079-05	WIRE ASS'Y;CH1 OUTPUT
	E38-0080-05	WIRE ASS'Y;VR1
	E38-0081-05	WIRE ASS'Y;VR2
	E38-0082-05	WIRE ASS'Y;CAL
	E38-0083-05	WIRE ASS'Y;R/O TO ATT
	F05-1224-05	FUSE(6X30MM) 1.2A/250V
	F05-8013-05	FUSE(5X20MM) T800MA/250V
	F05-8015-05	FUSE(6X30MM) 0.8A/250V
	F15-0733-04	FELT (CRT SHIELD)
	F20-0674-04	INSULATED SHEET,HIGH VOLTAGE
	H10-2901-02	FOAMED STYRENE PAD,FRONT
	H10-2902-12	FOAMED STYRENE PAD,REAR
	H20-1727-04	VINYL COVER
	H53-0032-04	CARTON BOX
	J31-0604-04	SPACER
	J61-0408-05	WIRE WRAPPING BAND
	J61-0509-05	WIRE WRAPPING BAND
	W03-2301-15	R/O PROBE, PC-31
C1	CC45CH2H330J	CAP. CERAMIC 33P 5% 500V
R1	RD14BB2C471J	RES. CARBON 470 5% 1/6W
1	A01-1194-12	CASE,TOP
2	A01-1195-32	CASE,BOTTOM
3	A13-0924-12	FRAME,RIGHT
4	A13-0933-22	FRAME,CENTER
5	A13-0934-22	FRAME,LEFT
6	A13-0927-13	FRAME,PCB SUPPORT
7	A13-0928-13	FRAME
8	A13-0929-03	FRAME
10	A20-2830-52	MOLDED PANEL ASS'Y
11	A21-1173-13	DECORATIVE PANEL
12	A21-1136-03	DECORATIVE PANEL
13	A23-1683-22	REAR PANEL
14	B11-0504-14	FILTER
15	B30-0979-05	LAMP ASS'Y;SCALE ILLUMINATION
16	B40-2936-03	NAME PLATE,MODEL
17	B41-0710-04	CAUTION LABEL;(HIGH VOLTAGE)
18	D19-0505-05	FLEXIBLE WIRE,FOR POWER SWITCH
19	G53-0015-14	BUSHING
20	E04-0259-05	BNC RECEPTACLE
21A	E18-0365-05	AC SELECTOR WITH 6X30MM FUSE
21B	E18-0366-15	AC SELECTOR WITH 5X20MM FUSE
22	E21-0660-04	TERMINAL,CAL
23	E21-0667-05	METAL TERMINAL
25	E31-5568-05	FLAT CABLE(AXM126)
26	E31-5569-05	FLAT CABLE(AXM120)
27	F07-0936-04	COVER ,HANDLE LATCH
28	F10-1604-04	SHIELD,R/O UNIT
29	F10-1605-13	SHIELD PLATE
30	F10-1606-03	SHIELD,HIGH VOLTAGE UNIT
31	F11-1212-12	SHIELD,CRT:FRONT
32	F11-1210-03	SHIELD,CRT:REAR
33	F20-0673-04	INSULATED SHEET
34	G02-0606-14	SPRING,FOR HANDLE
35	J02-0089-05	RUBBER FOOT(REAR)
36	J11-0508-05	CABLE CLAMP
37	J19-1656-03	HOLDER,COIL
38	J19-1657-04	WEDGE
39	J21-2906-05	GEAR,FOR HANDLE
40	J21-2907-05	RING,FOR HANDLE
41	J21-4642-04	BRACKET
42	J21-4613-04	BRACKET
43	J32-0887-04	BOSS,FOR POWER SWITCH
44	J21-4710-04	BRACKET
44	J61-0516-05	SUPPORT
45	J61-0521-05	SUPPORT
46	K01-0528-05	HANDLE,CARRYING
47	K21-0898-23	KNOB
48	K23-0808-03	KNOB(18 USED)
49	K27-0504-04	BUTTON;GRAY
50	K27-0543-04	BUTTON(34 USED)
51	L01-9766-05	POWER TRANSFORMER
52	L39-0533-05	COIL,TRACE ROTATION
53	L76-0119-05	DELAY LINE
54	S40-1524-05	PUSH SWITCH,POWER
55	W01-0503-04	REAR RUBBER FOOT/CORD WRAP
56	X66-1050-01	PANEL UNIT
57	X68-1500-01	POWER SUPPLY UNIT
58	X68-1510-03	HIGH VOLTAGE UNIT
59	X69-1150-02	SWITCH UNIT
60	X73-1760-01	VERTICAL PREAMP UNIT
61	X74-1480-03	HORIZONTAL UNIT
62	X75-1180-01	ATT. UNIT
63	X77-1490-01	R/O UNIT
64	X77-1500-01	CONNECTION UNIT
65	X80-1100-03	FINAL UNIT
66	X81-2330-03	VR UNIT
67	X76-1400-00	LINE COUNTER UNIT
68	J59-0403-05	NYLON RIVET (ILLUMI)
69	J19-1660-05	SUPPORT,FOR PCB
70	150YTM31	CRT

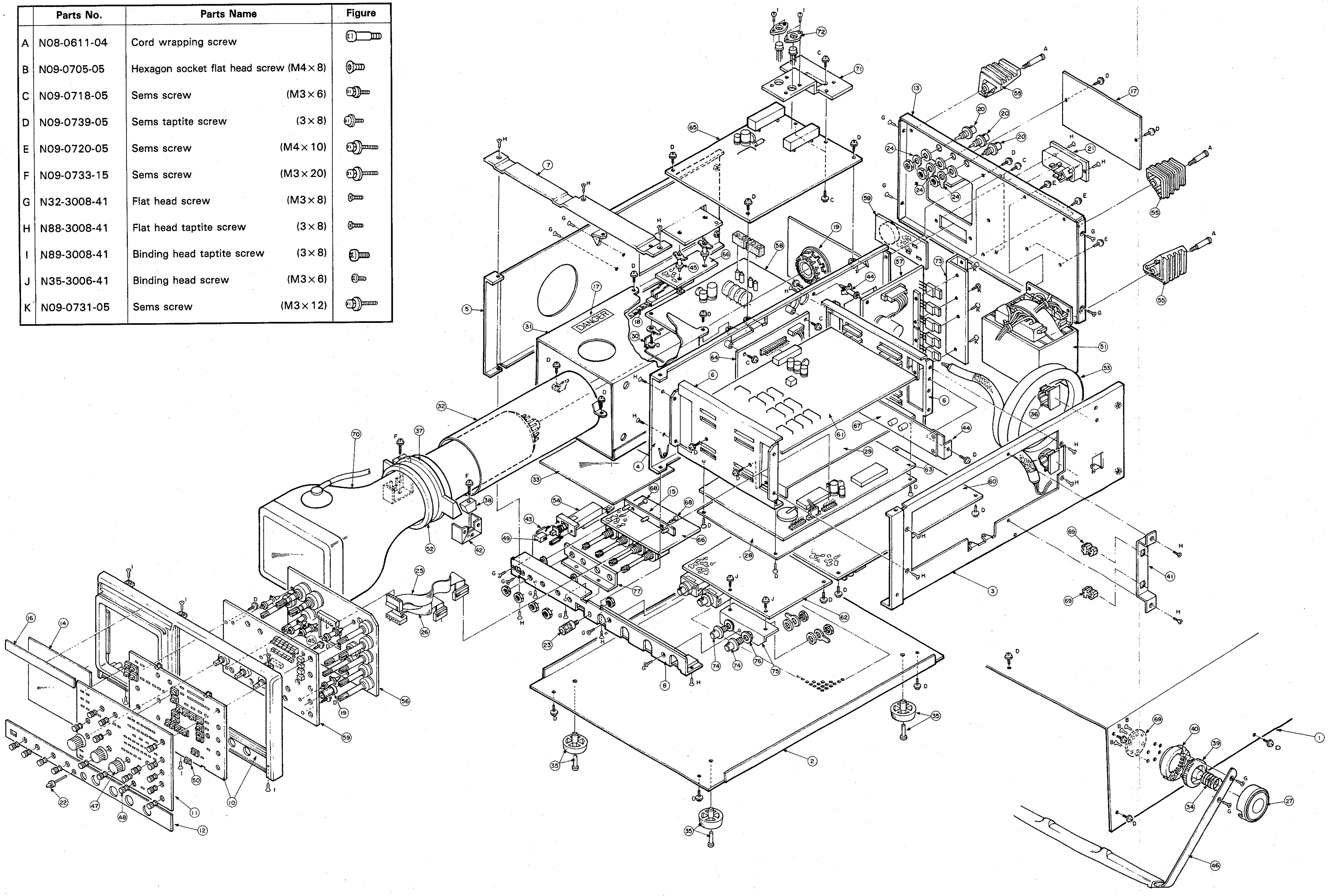
MODEL PC-31 (LOW CAPACITY PROBE)



ITEM	DESCRIPTION	PARTS NO.
①	Ground Wire Assembly	E30-1883-08
②	Retractable Hook Tip	E29-0540-08
③	Marker (Orange)	B42-1950-08

DISASSEMBLY

	Parts No.	Parts Name		Figure
A	N08-0611-04	Cord wrapping screw		
B	N09-0705-05	Hexagon socket flat head screw	(M4×8)	
C	N09-0718-05	Sems screw	(M3×6)	
D	N09-0739-05	Sems taptite screw	(3×8)	
E	N09-0720-05	Sems screw	(M4×10)	
F	N09-0733-15	Sems screw	(M3×20)	
G	N32-3008-41	Flat head screw	(M3×8)	
H	N88-3008-41	Flat head taptite screw	(3×8)	
I	N89-3008-41	Binding head taptite screw	(3×8)	
J	N35-3006-41	Binding head screw	(M3×6)	
K	N09-0731-05	Sems screw	(M3×12)	



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PARTS LIST

PANEL UNIT

X66-1050-01

REF.NO	PARTS NO	NAME & DESCRIPTION			
	J61-0529-05	SUPPORT			
	J73-0011-13	PCB (UNMOUNTED)			
	N09-0739-05	SCREW,SEMS BINDING TAPTITE 3X8			
	N19-0713-05	WASHER			
C1	C91-0757-05	CAP. CERAMIC	1000P	10%	50V
C2	C91-0757-05	CAP. CERAMIC	1000P	10%	50V
C3	C91-0757-05	CAP. CERAMIC	1000P	10%	50V
C4	C91-0757-05	CAP. CERAMIC	1000P	10%	50V
C5	C91-0757-05	CAP. CERAMIC	1000P	10%	50V
C6	C91-0757-05	CAP. CERAMIC	1000P	10%	50V
C7	C91-0757-05	CAP. CERAMIC	1000P	10%	50V
C8	C91-0757-05	CAP. CERAMIC	1000P	10%	50V
D1	MA700	DIODE			
D2	MA700	DIODE			
D3	1SS132	DIODE			
J31	E31-5555-05	LEAD WIRE WITH CONNECTOR			
P2	E40-7038-05	PIN CONNECTOR	26P		
Q1	2SC2785(F)	TR. SI, NPN			
Q2	2SA1175(F)	TR. SI, PNP			
Q3	2SC2785(F)	TR. SI, NPN			
Q4	2SA1175(F)	TR. SI, PNP			
Q5	NO USE				
Q6	2SC2785(F)	TR. SI, NPN			
Q7	2SC2785(F)	TR. SI, NPN			
R1	RN14BK2C2202F	RES. METAL FILM	22K	1%	1/6W
R2	RN14BK2C9103F	RES. METAL FILM	910K	1%	1/6W
R3	RN14BK2C9103F	RES. METAL FILM	910K	1%	1/6W
R4	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R5	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R6	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R7	RN14BK2C2202F	RES. METAL FILM	22K	1%	1/6W
R8	RN14BK2C9103F	RES. METAL FILM	910K	1%	1/6W
R9	RN14BK2C9103F	RES. METAL FILM	910K	1%	1/6W
R10	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R11	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R12	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R13	RN14BK2C6801F	RES. METAL FILM	6.8K	1%	1/6W
R14	RN14BK2C1802F	RES. METAL FILM	18K	1%	1/6W
R15	RD14BB2E220J	RES. CARBON	22	5%	1/4W
R16	RN14BK2C2002F	RES. METAL FILM	20K	1%	1/6W
R17	RN14BK2C4303F	RES. METAL FILM	430K	1%	1/6W
R18	RN14BK2C5102F	RES. METAL FILM	51K	1%	1/6W
R19	RN14BK2C3003F	RES. METAL FILM	300K	1%	1/6W
R20	RN14BK2C4702F	RES. METAL FILM	47K	1%	1/6W
R21	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R22	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R23	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
U1	NJM4558D	IC,DUAL OP AMP			
VR1	R05-3525-15	V.R.	20K B		
VR2	R05-3525-15	V.R.	20K B		
VR3	R05-3525-15	V.R.	20K B		
VR4	R05-3525-15	V.R.	20K B		
VR5	R05-3525-15	V.R.	20K B		
VR6	R05-3525-15	V.R.	20K B		
VR7	R05-3525-15	V.R.	20K B		
VR8	R05-3525-15	V.R.	20K B		
VR9	R05-3525-15	V.R.	20K B		
VR10	R05-3525-15	V.R.	20K B		
VR11	R10-3504-15	ENDLESS VOLUME	2X10K B		
VR12	R10-3504-15	ENDLESS VOLUME	2X10K B		
VR13	R10-3504-15	ENDLESS VOLUME	2X10K B		
VR14	R05-3525-15	V.R.	20K B		

POWER SUPPLY UNIT

X68-1500-01

REF.NO	PARTS NO	NAME & DESCRIPTION			
	F01-0865-14	HEAT SINK			
	J25-5227-13	PCB (UNMOUNTED)			
	N09-0731-05	SCREW,SEMS PAN HD M3X12			
	N14-0626-04	NUT			
	N17-1030-41	LOCK WASHER	M3		
	N30-3008-41	SCREW, PAN HD	M3X8		
C1	CE04W2E4R7M	CAP. ELECTRO	4.7	20%	250V
C2	CE04EW2A220M	CAP. ELECTRO	22	20%	100V
C3	CE04EW1C331M	CAP. ELECTRO	330	20%	16V
C4	CE04EW1C331M	CAP. ELECTRO	330	20%	16V
C5	CE04EW1E101M	CAP. ELECTRO	100	20%	25V
C6	CE04EW1A102M	CAP. ELECTRO	1000	20%	10V
C7	CE04W2E470M	CAP. ELECTRO	47	20%	250V
C8	CE04EW2A471M	CAP. ELECTRO	470	20%	100V
C9	C90-0973-05	CAP. ELECTRO	6800	20%	25V
C10	C90-0973-05	CAP. ELECTRO	6800	20%	25V
C11	C90-0982-05	CAP. ELECTRO	10000	20%	16V
C12	CE04BW1H010M	CAP. ELECTRO	1	20%	50V
C13	CE04EW1H331M	CAP. ELECTRO	330	20%	50V
C14	CE04EW1V471M	CAP. ELECTRO	470	20%	35V
C15	CE04EW1E101M	CAP. ELECTRO	100	20%	25V
C16	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C17	NO USE				
C18	CC45FCH1H470J	CAP. CERAMIC	47P	5%	50V
C19	CC45FCH1H470J	CAP. CERAMIC	47P	5%	50V
D1	1SS132	DIODE			
D2	1SS132	DIODE			
D3	MTZ13JB	DIODE, ZENER	12.88V		
D4	MTZ13JB	DIODE, ZENER	12.88V		
D5	MTZ5.1JB	DIODE, ZENER	5.07V		
D6	S1VB60	DIODE,STACK			
D7	S1VB60	DIODE,STACK			
D8	S4VB40F	DIODE, BRIDGE			
D9	S4VB40F	DIODE, BRIDGE			
D10	1SR35-200A	DIODE			
D11	1SR35-200A	DIODE			
D12	MTZ20JC	DIODE, ZENER	19.73V		
D13	MTZ7.5JA	DIODE, ZENER	7.04V		
P17	E40-5068-05	PIN CONNECTOR	11P		
P18	E40-7040-05	PIN CONNECTOR	13P		
Q1	2SD1409	TR. SI, NPN			
Q2	2SC2271(D)	TR. SI, NPN			
Q3	2SD1409	TR. SI, NPN			
Q4	2SC2271(D)	TR. SI, NPN			
Q5	2SB1133(S)	TR. SI, PNP			
Q6	2SD1666(S)	TR. SI, NPN			
Q7	2SB1133(S)	TR. SI, PNP			
Q8	2SA684(Q)	TR. SI, PNP			
R1	RN14BK2C1302F	RES. METAL FILM	13K	1%	1/6W
R2	RN14BK2C1803F	RES. METAL FILM	180K	1%	1/6W
R3	RD14BB2C123J	RES. CARBON	12K	5%	1/6W
R4	RN14BK2C2002F	RES. METAL FILM	20K	1%	1/6W
R5	RN14BK2C1203F	RES. METAL FILM	120K	1%	1/6W
R6	RD14BB2C912J	RES. CARBON	9.1K	5%	1/6W
R7	RN14BK2C2002F	RES. METAL FILM	20K	1%	1/6W
R8	RN14BK2C2002F	RES. METAL FILM	20K	1%	1/6W
R9	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R10	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R11	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R12	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R13	RD14BB2C512J	RES. CARBON	5.1K	5%	1/6W
R14	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R15	RN14BK2C2002F	RES. METAL FILM	20K	1%	1/6W
R16	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R17	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R18	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R19	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R20	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R21	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R22	NO USE				
R23	RD14BB2C362J	RES. CARBON	3.6K	5%	1/6W
R24	RD14BB2C163J	RES. CARBON	16K	5%	1/6W
R25	R92-1402-05	RES. SPECIAL POWER	24	5%	2W
R26	NO USE				
R27	R92-1402-05	RES. SPECIAL POWER	24	5%	2W
R28	RD14BB2C333J	RES. CARBON	33K	5%	1/6W
R29	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R30	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R31	R92-1421-05	RES. SPECIAL POWER	7.5	5%	3W
R32	RN14BK2C1502F	RES. METAL FILM	15K	1%	1/6W
R33	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R34	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R35	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R36	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R901	RD14BB2C331J	RES. CARBON	330	5%	1/6W
U1	NJM4556S	IC,DUAL OP AMP			
U2	NJM4556S	IC,DUAL OP AMP			
U3	NJM4556S	IC,DUAL OP AMP			
VR1	R12-1551-05	RES. SEMI FIXED	1KB		

PARTS LIST

HIGH VOLTAGE UNIT

X68-1510-03

REF.NO	PARTS NO	NAME & DESCRIPTION			
	F01-0813-05	HEAT SINK (CONVERTER)			
	F10-1601-04	SHIELD PLATE			
	F15-0727-04	HOLDER (NEON LAMP)			
	J25-5226-13	PCB (UNMOUNTED)			
	N30-3006-41	SCREW, PAN HD	M3X6		
C1	CE04EW1E221M	CAP. ELECTRO	220	20%	25V
C2	CE04EW1E221M	CAP. ELECTRO	220	20%	25V
C3	CK45B1H472K	CAP. CERAMIC	4700P	10%	50V
C4	CK45FB1H222K	CAP. CERAMIC	2200P	10%	50V
C5	CC45SL2H101J	CAP. CERAMIC	100P	5%	500V
C6	C91-1274-05	CAP. CERAMIC	2700P	10%	3.15K
C7	C91-1274-05	CAP. CERAMIC	2700P	10%	3.15K
C8	C91-1274-05	CAP. CERAMIC	2700P	10%	3.15K
C9	CK45B2H102K	CAP. CERAMIC	1000P	10%	500V
C10	CF92V1H224J	CAP. POLYESTER	0.22	5%	50V
C11	CF92V1H224J	CAP. POLYESTER	0.22	5%	50V
C12	CK45E3F102P	CAP. CERAMIC	1000P		3.1K
C13	C91-1274-05	CAP. CERAMIC	2700P	10%	3.15K
C14	C91-1274-05	CAP. CERAMIC	2700P	10%	3.15K
C15	C91-1274-05	CAP. CERAMIC	2700P	10%	3.15K
C16	C91-1274-05	CAP. CERAMIC	2700P	10%	3.15K
C17	C91-1274-05	CAP. CERAMIC	2700P	10%	3.15K
C18	CK45B2H102K	CAP. CERAMIC	1000P	10%	500V
C19	CE04HW1H010M	CAP. ELECTRO	1	20%	50V
C20	CK45FB2H472K	CAP. CERAMIC	4700P	10%	500V
C21	CC45CH2H010C	CAP. CERAMIC	1P	0.25P	500V
C22	CC45CH2H010C	CAP. CERAMIC	1P	0.25P	500V
C23	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C24	CC45CH2H020C	CAP. CERAMIC	2P	0.25P	500V
C25	CC45CH2H010C	CAP. CERAMIC	1P	0.25P	500V
C26	CE04HW1H010M	CAP. ELECTRO	1	20%	50V
C27	CK45FB2H472K	CAP. CERAMIC	4700P	10%	500V
C31	C91-1274-05	CAP. CERAMIC	2700P	10%	3.15K
C32	C91-1274-05	CAP. CERAMIC	2700P	10%	3.15K
C33	C91-1274-05	CAP. CERAMIC	2700P	10%	3.15K
C34	C91-1274-05	CAP. CERAMIC	2700P	10%	3.15K
C35	CE04W2C2R2M	CAP. ELECTRO	2.2	20%	160V
C36	CE04W2C2R2M	CAP. ELECTRO	2.2	20%	160V
C37	CK45FB2H472K	CAP. CERAMIC	4700P	10%	500V
C38	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C39	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C40	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C43	CE04EW0J102M	CAP. ELECTRO	1000	20%	6.3V
C44	CK45FB2H472K	CAP. CERAMIC	4700P	10%	500V
D1	1SS132	DIODE			
D2	1SS132	DIODE			
D3	1SS132	DIODE			
D4	1SR35-200A	DIODE			
D5	1SR35-200A	DIODE			
D6	1SS83	DIODE			
D7	1SS83	DIODE			
D8	1SR35-200A	DIODE			
D9	1SR35-200A	DIODE			
D10	1SS83	DIODE			
D11	1SS132	DIODE			
D12	1SS132	DIODE			
D13	1SS83	DIODE			
L1	L40-3925-04	FERRI INDUCTOR	3.9MH	5%	
L2	L40-1011-04	FERRI INDUCTOR	100UH	10%	
L3	L40-1011-04	FERRI INDUCTOR	100UH	10%	
L4	L40-1545-06	FERRI INDUCTOR	150MH	5%	
NL1	NE-2B	NEON LAMP			
NL2	NE-2B	NEON LAMP			
NL3	NE-2B	NEON LAMP			
NL4	NE-2B	NEON LAMP			
P19	E40-5069-05	PIN CONNECTOR	12P		
P22	E40-3237-05	PIN CONNECTOR	2P		
P23	E40-0503-05	PIN CONNECTOR	5P		
P24	E40-3238-05	PIN CONNECTOR	3P		
P25	E40-3239-05	PIN CONNECTOR	4P		
P26	E40-5067-05	PIN CONNECTOR	10P		
Q1	2SD613(E)	TR. SI, NPN			
Q2	2SA1175(F)	TR. SI, PNP			
Q3	2SA1208(S,T)	TR. SI, PNP			
Q4	2SC2910(S,T)	TR. SI, NPN			
Q5	2SA1209(S,T)	TR. SI, PNP			
Q6	2SC2911(S,T)	TR. SI, NPN			
Q7	2SA1175(F)	TR. SI, PNP			
Q8	2SC3315(C)	TR. SI, NPN			
R1	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R2	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R3	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R4	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R5	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R6	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R7	R92-1127-05	RES. FIXED	8.2M	1%	1W
R8	R92-1125-05	RES. METAL FILM	7.5M	1%	1W
R9	RN14BK2C1003F	RES. METAL FILM	100K	1%	1/6W
R10	R92-1034-05	RES. METAL FILM	47M	5%	1/2W
R11	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R12	RD14BB2C474J	RES. CARBON	470K	5%	1/6W
R13	R92-1034-05	RES. METAL FILM	47M	5%	1/2W
R14	RD14BB2C474J	RES. CARBON	470K	5%	1/6W
R15	RD14BB2C823J	RES. CARBON	82K	5%	1/6W
R16	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R17	RD14BB2C753J	RES. CARBON	75K	5%	1/6W
R18	RD14BB2C114J	RES. CARBON	110K	5%	1/6W
R19	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R20	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R21	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R22	RD14BB2C134J	RES. CARBON	130K	5%	1/6W
R23	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R24	RD14BB2C134J	RES. CARBON	130K	5%	1/6W
R25	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R26	RD14BB2C913J	RES. CARBON	91K	5%	1/6W
R27	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R28	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R29	RD14BB2C133J	RES. CARBON	13K	5%	1/6W
R30	RD14BB2C203J	RES. CARBON	20K	5%	1/6W
R34	R92-1422-05	RES. FIXED	3.9M	5%	1/2W
R35	R92-1422-05	RES. FIXED	3.9M	5%	1/2W
R36	RD14BB2C203J	RES. CARBON	20K	5%	1/6W
R37	RN14BK2E5103F	RES. METAL FILM	510K	1%	1/4W
R38	NO USE				
R39	RD14BB2C204J	RES. CARBON	200K	5%	1/6W
R40	RD14BB2C684J	RES. CARBON	680K	5%	1/6W
R41	RD14BB2C684J	RES. CARBON	680K	5%	1/6W
R42	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R43	RD14BB2C2R2J	RES. CARBON	2.2	5%	1/6W
R44	R92-1026-05	RES. METAL FILM	3.3M		
R45	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R46	RD14BB2C243J	RES. CARBON	24K	5%	1/6W
R47	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R48	RD14BB2C101J	RES. CARBON	100	5%	1/6W
U1	NJM4558D	IC,DUAL OP AMP			
VR1	R12-5524-05	RES. SEMI FIXED	100KB		
VR2	R12-8501-05	RES. SEMI FIXED	2.2MB		
W1	W02-0458-05	HIGH VOLTAGE UNIT			

PARTS LIST

SWITCH UNIT

X69-1150-02

REF.NO	PARTS NO	NAME & DESCRIPTION			
	J73-0012-03	PCB (UNMOUNTED)			
C4	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C5	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C6	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C7	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C8	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C9	CK45F1H103Z	CAP. CERAMIC	0.01		50V
D38	B30-0964-05	LED			
D39	B30-0965-05	LED			
D40	B30-0964-05	LED			
D41	B30-0965-05	LED			
D42	B30-0964-05	LED			
D43	B30-0965-05	LED			
D44	B30-0965-05	LED			
D45	1SS132	DIODE			
D46	1SS132	DIODE			
D47	1SS132	DIODE			
D48	1SS132	DIODE			
D49	1SS132	DIODE			
P1	E40-7036-05	PIN CONNECTOR	20P		
P37	E40-3237-05	PIN CONNECTOR	2P		
R15	R90-0652-05	RES. NETWORK	6X10K	5%	
R16	R90-0653-05	RES. NETWORK	8X10K	5%	
R17	R90-0614-05	RES. NETWORK	8X390	5%	
R18	R90-0639-05	RES. NETWORK	6X390	5%	
R19	R90-0639-05	RES. NETWORK	6X390	5%	
R20	R90-0639-05	RES. NETWORK	6X390	5%	
R21	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R22	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R23	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R24	RD14BB2C391J	RES. CARBON	390	5%	1/6W
S1	W02-0497-05	ROTARY ENCORDER			
S2	W02-0497-05	ROTARY ENCORDER			
S3	W02-0497-05	ROTARY ENCORDER			
S4	S40-2525-05	SWITCH			
S5	S40-2525-05	SWITCH			
S6	S40-2525-05	SWITCH			
S7	S40-2525-05	SWITCH			
S8	S40-2525-05	SWITCH			
S9	S40-2525-05	SWITCH			
S10	S40-2525-05	SWITCH			
S11	S40-2525-05	SWITCH			
S12	S40-2525-05	SWITCH			
S13	S40-2525-05	SWITCH			
S14	S40-2525-05	SWITCH			
S15	S40-2525-05	SWITCH			
S16	S40-2525-05	SWITCH			
S17	S40-2525-05	SWITCH			
S18	S40-2525-05	SWITCH			
S19	S40-2525-05	SWITCH			
S20	S40-2525-05	SWITCH			
S21	S40-2525-05	SWITCH			
S22	S40-2525-05	SWITCH			
S23	S40-2525-05	SWITCH			
S24	S40-2525-05	SWITCH			
S25	S40-2525-05	SWITCH			
S26	S40-2525-05	SWITCH			
S27	S40-2525-05	SWITCH			
S28	S40-2525-05	SWITCH			
S29	S40-2525-05	SWITCH			
S30	S40-2525-05	SWITCH			
S31	S40-2525-05	SWITCH			
S32	S40-2525-05	SWITCH			
S33	S40-2525-05	SWITCH			
S34	S40-2525-05	SWITCH			
S35	S40-2525-05	SWITCH			
S36	S40-2525-05	SWITCH			
S37	S40-2525-05	SWITCH			
U2	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH			
U3	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH			
U4	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH			
U5	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH			
U6	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH			
U7	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH			
U8	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH			
U9	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH			

VERTICAL PREAMP UNIT

X73-1760-01

REF.NO	PARTS NO	NAME & DESCRIPTION			
	E31-5576-05	WIRE ASS'Y(GND TO GND)			
	E31-5577-05	WIRE ASS'Y(NO.A,B,C,D)			
	F07-0949-04	COVER			
	J61-0408-05	WIRE WRAPPING BAND			
	J73-0010-02	PCB (UNMOUNTED)			
C1	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C2	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C3	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C4	CE04EW1A101M	CAP. ELECTRO	100	20%	10V
C5	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C6	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C7	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C8	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C9	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C19	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C20	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C21	CE04EW1C100M	CAP. ELECTRO	10	20%	16V
C22	CE04EW1C100M	CAP. ELECTRO	10	20%	16V
C23	NO USE				
C24	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C25	CQ92FM1H103K	CAP. MYLAR	0.01	10%	50V
C26	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C27	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C28	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C29	CC45FCH1H470J	CAP. CERAMIC	47P	5%	50V
C30	CC45FCH1H470J	CAP. CERAMIC	47P	5%	50V
C31	CC45FCH1H470J	CAP. CERAMIC	47P	5%	50V
C32	CC45FCH1H470J	CAP. CERAMIC	47P	5%	50V
C33	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C34	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C35	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C36	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C37	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C38	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C39	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C40	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C41	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C42	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C43	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C44	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C45	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C46	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C103	CC45FCH1H020C	CAP. CERAMIC	2P	0.25P	50V
C104	CC45FCH1H050C	CAP. CERAMIC	5P	0.25P	50V
C105	NO USE				
C106	CC45FCH1H060D	CAP. CERAMIC	6P	0.5P	50V
C107	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C108	CC45FCH1H150J	CAP. CERAMIC	15P	5%	50V
C109	CK45B1H102K	CAP. CERAMIC	1000P	10%	50V
C110	CC45CH1H010C	CAP. CERAMIC	1P	0.25P	50V
C111	CC45FCH1H030C	CAP. CERAMIC	3P	0.25P	50V
C112	CC45CH1H010C	CAP. CERAMIC	1P	0.25P	50V
C113	CC45FCH1H020C	CAP. CERAMIC	2P	0.25P	50V
C114	CC45FCH1H020C	CAP. CERAMIC	2P	0.25P	50V
C203	CC45FCH1H020C	CAP. CERAMIC	2P	0.25P	50V
C204	CC45FCH1H050C	CAP. CERAMIC	5P	0.25P	50V
C205	NO USE				
C206	CC45FCH1H060D	CAP. CERAMIC	6P	0.5P	50V
C207	NO USE				
C208	CC45FCH1H150J	CAP. CERAMIC	15P	5%	50V
C209	CK45B1H102K	CAP. CERAMIC	1000P	10%	50V
C210	CC45CH1H010C	CAP. CERAMIC	1P	0.25P	50V
C211	CC45FCH1H030C	CAP. CERAMIC	3P	0.25P	50V
C212	CC45CH1H010C	CAP. CERAMIC	1P	0.25P	50V
C213	CC45FCH1H020C	CAP. CERAMIC	2P	0.25P	50V
C214	CC45FCH1H020C	CAP. CERAMIC	2P	0.25P	50V
C301	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C401	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C402	CQ92M1H104K	CAP. MYLAR	0.1	10%	50V
C501	CC45FCH1H680J	CAP. CERAMIC	68P	5%	50V
C502	CC45FCH1H680J	CAP. CERAMIC	68P	5%	50V
C503	CC45CH1H120J	CAP. CERAMIC	12P	5%	50V
C504	CC45CH1H120J	CAP. CERAMIC	12P	5%	50V
C505	CC45FCH1H020C	CAP. CERAMIC	2P	0.25P	50V
C506	CC45FCH1H020C	CAP. CERAMIC	2P	0.25P	50V

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
C509	CC45SL1H471J	CAP. CERAMIC	470P	5%	50V
C510	CC45SL1H471J	CAP. CERAMIC	470P	5%	50V
C511	CQ92M1H104K	CAP. MYLAR	0.1	10%	50V
C512	NO USE				
C513	CC45FCH1H040C	CAP. CERAMIC	4P	0.25P	50V
C514	CC45FCH1H040C	CAP. CERAMIC	4P	0.25P	50V
C515	CC45CH1H040C	CAP. CERAMIC	4P	0.25P	50V
C516	CC45CH1H040C	CAP. CERAMIC	4P	0.25P	50V
C517	CQ92FM1H103K	CAP. MYLAR	0.01	10%	50V
C518	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C519	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C520	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C601	CC45FCH1H100D	CAP. CERAMIC	10P	0.5P	50V
C602	CC45FCH1H070D	CAP. CERAMIC	7P	0.5P	50V
C603	CC45FCH1H120J	CAP. CERAMIC	12P	5%	50V
C604	CC45FCH1H120J	CAP. CERAMIC	12P	5%	50V
C605	CE04HW1H010M	CAP. ELECTRO	1	20%	50V
C606	CC45CH1H010C	CAP. CERAMIC	1P	0.25P	50V
C607	CE04HW1E220M	CAP. ELECTRO	22	20%	25V
C608	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C609	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C610	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C611	NO USE				
C612	CC45FCH1H020C	CAP. CERAMIC	2P	0.25P	50V
C701	CC45CH1H470J	CAP. CERAMIC	47P	5%	50V
C702	CC45CH1H470J	CAP. CERAMIC	47P	5%	50V
C703	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C704	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C705	CC45FCH1H220J	CAP. CERAMIC	22P	5%	50V
C706	CC45FCH1H220J	CAP. CERAMIC	22P	5%	50V
C707	CQ92M1H104K	CAP. MYLAR	0.1	10%	50V
C708	NO USE				
C709	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C710	NO USE				
C711	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C714	CE04EW1A101M	CAP. ELECTRO	100	20%	10V
C715	CE04EW1A101M	CAP. ELECTRO	100	20%	10V
C716	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C720	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C721	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C801	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C802	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C803	CC45CH1H0R5C	CAP. CERAMIC	0.5P	0.25P	50V
C804	CC45CH1H0R5C	CAP. CERAMIC	0.5P	0.25P	50V
C805	CC45CH1H330J	CAP. CERAMIC	33P	5%	50V
C806	CC45SL1H470J	CAP. CERAMIC	47P	5%	50V
C807	CC45SL1H470J	CAP. CERAMIC	47P	5%	50V
C808	CQ92M1H104K	CAP. MYLAR	0.1	10%	50V
C809	CQ92M1H104K	CAP. MYLAR	0.1	10%	50V
C810	CQ92FM1H473K	CAP. MYLAR	0.047	10%	50V
C811	CQ92FM1H473K	CAP. MYLAR	0.047	10%	50V
C812	CQ92FM1H473K	CAP. MYLAR	0.047	10%	50V
C813	CQ92FM1H473K	CAP. MYLAR	0.047	10%	50V
C901	CC45CH1H040C	CAP. CERAMIC	4P	0.25P	50V
C902	CC45CH1H040C	CAP. CERAMIC	4P	0.25P	50V
C903	CC45CH1H040C	CAP. CERAMIC	4P	0.25P	50V
C904	CC45CH1H040C	CAP. CERAMIC	4P	0.25P	50V
C905	CC45CH1H040C	CAP. CERAMIC	4P	0.25P	50V
C906	CC45CH1H040C	CAP. CERAMIC	4P	0.25P	50V
C907	CC45CH1H040C	CAP. CERAMIC	4P	0.25P	50V
C908	CC45CH1H040C	CAP. CERAMIC	4P	0.25P	50V
C909	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C910	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C911	CQ92M1H103K	CAP. MYLAR	0.01	10%	50V
C912	CC45CH1H030C	CAP. CERAMIC	3P	0.25P	50V
C913	CC45CH1H030C	CAP. CERAMIC	3P	0.25P	50V
D101	1SS132	DIODE			
D102	1SS132	DIODE			
D201	1SS132	DIODE			
D202	1SS132	DIODE			
D501	1SS132	DIODE			
D502	1SS132	DIODE			
D503	1SS132	DIODE			
D504	1SS132	DIODE			
D505	1SS132	DIODE			

REF.NO	PARTS NO	NAME & DESCRIPTION	
D506	1SS132	DIODE	
D507	1SS132	DIODE	
D508	1SS132	DIODE	
D509	1SS132	DIODE	
D510	MTZ10JC	DIODE, ZENER	9.95V
D511	1SS132	DIODE	
D512	MTZ5.1JB	DIODE, ZENER	5.07V
D601	DAP401	DIODE ARRAY	
D602	DAP401	DIODE ARRAY	
D603	1SS132	DIODE	
K101	S51-2508-05	RELAY	
K102	S51-2508-05	RELAY	
K201	S51-2508-05	RELAY	
K202	S51-2508-05	RELAY	
P5	E40-3238-05	PIN CONNECTOR	3P
P6	E40-3238-05	PIN CONNECTOR	3P
P7	E38-0089-05	WIRE ASS'Y	
P8	E38-0089-05	WIRE ASS'Y	
P9	E40-3238-05	PIN CONNECTOR	3P
P10	E40-7039-05	PIN CONNECTOR	20P
P11	E40-3238-05	PIN CONNECTOR	3P
P30	E40-3237-05	PIN CONNECTOR	2P
Q1	2SA1005(K)	TR. SI, PNP	
Q2	2SA1005(K)	TR. SI, PNP	
Q3	2SA1005(K)	TR. SI, PNP	
Q4	2SA1005(K)	TR. SI, PNP	
Q5	2SA1005(K)	TR. SI, PNP	
Q6	2SA1005(K)	TR. SI, PNP	
Q7	2SA1005(K)	TR. SI, PNP	
Q8	2SA1005(K)	TR. SI, PNP	
Q101	2SC4072	TR. SI, NPN	
Q102	2SC4072	TR. SI, NPN	
Q103	2SC3779(D)	TR. SI, NPN	
Q104	2SC3779(D)	TR. SI, NPN	
Q105	2SC3315(C)	TR. SI, NPN	
Q106	2SC3315(C)	TR. SI, NPN	
Q107	2SC3315(C)	TR. SI, NPN	
Q108	2SA1161	TR. SI, PNP	
Q109	2SA1161	TR. SI, PNP	
Q110	2SC4049	TR. SI, NPN	
Q111	2SC4049	TR. SI, NPN	
Q112	2SC3779(D)	TR. SI, NPN	
Q113	2SC3779(D)	TR. SI, NPN	
Q114	2SC3779(D)	TR. SI, NPN	
Q115	2SC3779(D)	TR. SI, NPN	
Q116	2SC2785(F)	TR. SI, NPN	
Q117	2SC3779(D)	TR. SI, NPN	
Q118	2SC3779(D)	TR. SI, NPN	
Q119	2SC3779(D)	TR. SI, NPN	
Q120	2SC3779(D)	TR. SI, NPN	
Q201	2SC4072	TR. SI, NPN	
Q202	2SC4072	TR. SI, NPN	
Q203	2SC3779(D)	TR. SI, NPN	
Q204	2SC3779(D)	TR. SI, NPN	
Q205	2SC3315(C)	TR. SI, NPN	
Q206	2SC3315(C)	TR. SI, NPN	
Q207	2SC3315(C)	TR. SI, NPN	
Q208	2SA1161	TR. SI, PNP	
Q209	2SA1161	TR. SI, PNP	
Q210	2SC4049	TR. SI, NPN	
Q211	2SC4049	TR. SI, NPN	
Q212	2SC3779(D)	TR. SI, NPN	
Q213	2SC3779(D)	TR. SI, NPN	
Q214	2SC3779(D)	TR. SI, NPN	
Q215	2SC3779(D)	TR. SI, NPN	
Q216	2SC2785(F)	TR. SI, NPN	
Q217	2SC3779(D)	TR. SI, NPN	
Q218	2SC3779(D)	TR. SI, NPN	
Q219	2SC3779(D)	TR. SI, NPN	
Q220	2SC3779(D)	TR. SI, NPN	
Q301	2SC3779(D)	TR. SI, NPN	
Q302	2SC3779(D)	TR. SI, NPN	
Q303	2SC3779(D)	TR. SI, NPN	
Q304	2SC3779(D)	TR. SI, NPN	
Q401	2SC3779(D)	TR. SI, NPN	
Q402	2SC3779(D)	TR. SI, NPN	

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
Q403	2SC3779(D)	TR. SI, NPN			
Q404	2SC3779(D)	TR. SI, NPN			
Q501	2SA1206	TR. SI, PNP			
Q502	2SA1206	TR. SI, PNP			
Q503	2SC3315(C)	TR. SI, NPN			
Q504	2SC3315(C)	TR. SI, NPN			
Q505	2SA1206	TR. SI, PNP			
Q506	2SA1206	TR. SI, PNP			
Q507	2SC3315(C)	TR. SI, NPN			
Q508	2SC3315(C)	TR. SI, NPN			
Q509	2SA1206	TR. SI, PNP			
Q510	2SA1206	TR. SI, PNP			
Q511	2SC3315(C)	TR. SI, NPN			
Q512	2SC3315(C)	TR. SI, NPN			
Q513	2SA1206	TR. SI, PNP			
Q514	2SA1206	TR. SI, PNP			
Q515	2SC3315(C)	TR. SI, NPN			
Q516	2SC3315(C)	TR. SI, NPN			
Q517	NO USE				
Q518	2SC3732(L)	TR. SI, NPN			
Q519	2SA1206	TR. SI, PNP			
Q520	2SA1206	TR. SI, PNP			
Q521	2SA1175(F)	TR. SI, PNP			
Q522	2SA1175(F)	TR. SI, PNP			
Q523	2SA1175(F)	TR. SI, PNP			
Q524	2SC3779(D)	TR. SI, NPN			
Q525	2SC3779(D)	TR. SI, NPN			
Q526	2SA1206	TR. SI, PNP			
Q527	2SA1206	TR. SI, PNP			
Q528	2SA1161	TR. SI, PNP			
Q529	2SA1161	TR. SI, PNP			
Q601	2SA1206	TR. SI, PNP			
Q602	2SA1206	TR. SI, PNP			
Q603	2SC3779(D)	TR. SI, NPN			
Q604	2SA1206	TR. SI, PNP			
Q605	2SA1206	TR. SI, PNP			
Q606	2SA1206	TR. SI, PNP			
Q607	2SC3779(D)	TR. SI, NPN			
Q608	2SA1206	TR. SI, PNP			
Q609	2SA1206	TR. SI, PNP			
Q610	2SA1206	TR. SI, PNP			
Q611	2SC3779(D)	TR. SI, NPN			
Q612	2SA1206	TR. SI, PNP			
Q613	2SA1206	TR. SI, PNP			
Q614	2SA1206	TR. SI, PNP			
Q615	2SC3779(D)	TR. SI, NPN			
Q616	2SA1206	TR. SI, PNP			
Q617	2SA1161	TR. SI, PNP			
Q618	2SA1161	TR. SI, PNP			
Q619	2SA1175(F)	TR. SI, PNP			
Q620	2SA1175(F)	TR. SI, PNP			
Q621	2SC3779(D)	TR. SI, NPN			
Q622	2SC3779(D)	TR. SI, NPN			
Q623	2SC2785(F)	TR. SI, NPN			
Q624	2SC3315(C)	TR. SI, NPN			
Q625	2SC3315(C)	TR. SI, NPN			
Q626	2SC3315(C)	TR. SI, NPN			
Q627	2SC3315(C)	TR. SI, NPN			
Q628	2SC3315(C)	TR. SI, NPN			
Q629	2SC3315(C)	TR. SI, NPN			
Q630	2SC3315(C)	TR. SI, NPN			
Q631	2SC3315(C)	TR. SI, NPN			
Q632	2SC3779(D)	TR. SI, NPN			
Q633	2SC3779(D)	TR. SI, NPN			
R1	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R2	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R3	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R4	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R5	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R6	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R7	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R8	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R9	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R10	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R11	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R12	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R13	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R14	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R101	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R102	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R103	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R104	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R105	NO USE				
R106	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R107	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R108	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R109	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R110	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R111	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R112	RD14BB2C820J	RES. CARBON	82	5%	1/6W
R117	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R118	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R119	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R120	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R121	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R122	RD14BB2C750J	RES. CARBON	75	5%	1/6W
R123	RD14BB2C301J	RES. CARBON	300	5%	1/6W
R124	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R125	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R126	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R127	RN14BK2C3601F	RES. METAL FILM	3.6K	1%	1/6W
R128	RN14BK2C4301F	RES. METAL FILM	4.3K	1%	1/6W
R129	RN14BK2C4300F	RES. METAL FILM	430	1%	1/6W
R130	NO USE				
R131	RN14BK2C3000F	RES. METAL FILM	300	1%	1/6W
R132	RN14BK2C3000F	RES. METAL FILM	300	1%	1/6W
R133	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R134	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R135	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R136	RN14BK2C3601F	RES. METAL FILM	3.6K	1%	1/6W
R137	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R138	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R139	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R140	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R141	RN14BK2C1601F	RES. METAL FILM	1.6K	1%	1/6W
R142	RN14BK2C1601F	RES. METAL FILM	1.6K	1%	1/6W
R143	RN14BK2C3000D	RES. METAL FILM	300	0.5%	1/6W
R144	RN14BK2C3000D	RES. METAL FILM	300	0.5%	1/6W
R145	RN14BK2C1500D	RES. METAL FILM	150	0.5%	1/6W
R146	RN14BK2C1500D	RES. METAL FILM	150	0.5%	1/6W
R147	RN14BK2C3000D	RES. METAL FILM	300	0.5%	1/6W
R148	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R149	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R150	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R151	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R152	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R153	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R154	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R155	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R156	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R157	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R158	RN14BK2C1600F	RES. METAL FILM	160	1%	1/6W
R159	RN14BK2C1600F	RES. METAL FILM	160	1%	1/6W
R160	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R161	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R162	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R163	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R164	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R167	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R168	NO USE				
R169	RN14BK2C91R0F	RES. METAL FILM	91.0	1%	1/6W
R170	RN14BK2C91R0F	RES. METAL FILM	91.0	1%	1/6W
R171	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R172	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R173	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R174	RN14BK2C4702F	RES. METAL FILM	47K	1%	1/6W
R175	RN14BK2C4702F	RES. METAL FILM	47K	1%	1/6W
R176	RN14BK2C1301F	RES. METAL FILM	1.3K	1%	1/6W
R177	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R178	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R179	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R180	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R181	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R182	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R183	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R184	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R185	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R186	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R187	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R190	RD14BB2C270J	RES. CARBON	27	5%	1/6W
R201	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R202	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R203	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R204	NO USE				

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R205	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R206	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R207	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R208	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R209	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R210	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R211	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R212	RD14BB2C820J	RES. CARBON	82	5%	1/6W
R217	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R218	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R219	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R220	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R221	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R222	RD14BB2C750J	RES. CARBON	75	5%	1/6W
R223	RD14BB2C301J	RES. CARBON	300	5%	1/6W
R224	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R225	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R226	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R227	RN14BK2C3601F	RES. METAL FILM	3.6K	1%	1/6W
R228	RN14BK2C4301F	RES. METAL FILM	4.3K	1%	1/6W
R229	RN14BK2C4300F	RES. METAL FILM	430	1%	1/6W
R230	NO USE				
R231	RN14BK2C3000F	RES. METAL FILM	300	1%	1/6W
R232	RN14BK2C3000F	RES. METAL FILM	300	1%	1/6W
R233	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R234	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R235	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R236	RN14BK2C3601F	RES. METAL FILM	3.6K	1%	1/6W
R237	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R238	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R239	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R240	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R241	RN14BK2C1601F	RES. METAL FILM	1.6K	1%	1/6W
R242	RN14BK2C1601F	RES. METAL FILM	1.6K	1%	1/6W
R243	RN14BK2C3000D	RES. METAL FILM	300	0.5%	1/6W
R244	RN14BK2C3000D	RES. METAL FILM	300	0.5%	1/6W
R245	RN14BK2C1500D	RES. METAL FILM	150	0.5%	1/6W
R246	RN14BK2C1500D	RES. METAL FILM	150	0.5%	1/6W
R247	RN14BK2C3000D	RES. METAL FILM	300	0.5%	1/6W
R248	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R249	NO USE				
R250	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R251	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R252	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R253	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R254	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R255	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R256	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R257	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R258	RN14BK2C1600F	RES. METAL FILM	160	1%	1/6W
R259	RN14BK2C1600F	RES. METAL FILM	160	1%	1/6W
R260	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R261	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R262	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R263	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R264	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R267	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R268	NO USE				
R269	RN14BK2C91R0F	RES. METAL FILM	91.0	1%	1/6W
R270	RN14BK2C91R0F	RES. METAL FILM	91.0	1%	1/6W
R271	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R272	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R273	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R274	RN14BK2C4702F	RES. METAL FILM	47K	1%	1/6W
R275	RN14BK2C4702F	RES. METAL FILM	47K	1%	1/6W
R276	RN14BK2C1301F	RES. METAL FILM	1.3K	1%	1/6W
R277	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R278	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R279	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R280	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R281	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R282	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R283	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R284	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R285	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R286	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R287	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R290	RD14BB2C270J	RES. CARBON	27	5%	1/6W
R301	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R302	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R303	RD14BB2C220J	RES. CARBON	22	5%	1/6W

REF.NO	PARTS NO	NAME & DESCRIPTION			
R304	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R305	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R306	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R307	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R308	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R309	RN14BK2C1801F	RES. METAL FILM	1.8K	1%	1/6W
R310	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R311	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R312	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R313	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R314	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R315	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R401	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R402	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R403	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R404	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R405	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R406	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R407	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R408	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R409	RN14BK2C1801F	RES. METAL FILM	1.8K	1%	1/6W
R410	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R411	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R412	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R413	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R414	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R415	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R501	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R502	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R503	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R504	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R505	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R506	RD14BB2C433J	RES. CARBON	43K	5%	1/6W
R507	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R508	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R509	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R510	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R511	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R512	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R513	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R514	RD14BB2C243J	RES. CARBON	24K	5%	1/6W
R515	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R516	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R517	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R518	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R519	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R520	RD14BB2C433J	RES. CARBON	43K	5%	1/6W
R521	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R522	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R523	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R524	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R525	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R526	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R527	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R528	RD14BB2C243J	RES. CARBON	24K	5%	1/6W
R529	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R530	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R531	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R532	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R533	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R534	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R535	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R536	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R537	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R538	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R539	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R540	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R541	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R542	RD14BB2C243J	RES. CARBON	24K	5%	1/6W
R543	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R544	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R545	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R546	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R547	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R548	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R549	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R550	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R551	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R552	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R553	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R554	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R555	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R556	RD14BB2C243J	RES. CARBON	24K	5%	1/6W
R557	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R558	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R559	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R560	RN14BK2C8200F	RES. METAL FILM	820	1%	1/6W
R561	RN14BK2C8200F	RES. METAL FILM	820	1%	1/6W
R562	RN14BK2C8200F	RES. METAL FILM	820	1%	1/6W
R563	RN14BK2C8200F	RES. METAL FILM	820	1%	1/6W
R564	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R565	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R566	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R567	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R568	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R569	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R570	RN14BK2C6200F	RES. METAL FILM	620	1%	1/6W
R571	RN14BK2C6200F	RES. METAL FILM	620	1%	1/6W
R572	RN14BK2C1801F	RES. METAL FILM	1.8K	1%	1/6W
R573	RN14BK2C1801F	RES. METAL FILM	1.8K	1%	1/6W
R574	RD14BB2C132J	RES. CARBON	1.3K	5%	1/6W
R575	RD14BB2C432J	RES. CARBON	4.3K	5%	1/6W
R576	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R577	RD14BB2C132J	RES. CARBON	1.3K	5%	1/6W
R578	RD14BB2C132J	RES. CARBON	1.3K	5%	1/6W
R579	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R580	RD14BB2C113J	RES. CARBON	11K	5%	1/6W
R581	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R582	RD14BB2C393J	RES. CARBON	39K	5%	1/6W
R583	RN14BK2C8200F	RES. METAL FILM	820	1%	1/6W
R584	RN14BK2C8200F	RES. METAL FILM	820	1%	1/6W
R585	RN14BK2C4300F	RES. METAL FILM	430	1%	1/6W
R586	RN14BK2C4300F	RES. METAL FILM	430	1%	1/6W
R587	RN14BK2C91R0F	RES. METAL FILM	91.0	1%	1/6W
R588	RN14BK2C91R0F	RES. METAL FILM	91.0	1%	1/6W
R589	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R590	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R591	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R592	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R593	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R594	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R595	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R596	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R597	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R598	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R599	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R600	NO USE				
R601	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R602	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R603	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R604	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R605	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R606	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R607	RN14BK2C1200F	RES. METAL FILM	120	1%	1/6W
R608	NO USE				
R609	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R610	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R611	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R612	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R613	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R614	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R615	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R616	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R617	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R618	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R619	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R620	RN14BK2C1200F	RES. METAL FILM	120	1%	1/6W
R621	NO USE				
R622	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R623	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R624	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R625	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R626	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R627	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R628	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R629	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R630	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R631	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R632	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R633	RN14BK2C1300F	RES. METAL FILM	130	1%	1/6W
R634	NO USE				
R635	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R636	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R637	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R638	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R639	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R640	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R641	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R642	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R643	RD14BB2C101J	RES. CARBON	100	5%	1/6W

REF.NO	PARTS NO	NAME & DESCRIPTION			
R644	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R645	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R646	RN14BK2C1300F	RES. METAL FILM	130	1%	1/6W
R647	NO USE				
R648	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R649	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R650	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R651	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R652	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R653	RD14BB2C822J	RES. CARBON	8.2K	5%	1/6W
R654	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R655	R90-0657-05	RES. MULTIPLE	8X330	1%	
R656	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R657	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R658	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R659	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R660	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R661	RN14BK2C2701F	RES. METAL FILM	2.7K	1%	1/6W
R662	RN14BK2C2701F	RES. METAL FILM	2.7K	1%	1/6W
R663	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R664	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R665	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R666	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R667	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R668	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R669	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R670	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R671	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R672	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R673	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R674	RN14BK2C2701F	RES. METAL FILM	2.7K	1%	1/6W
R675	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R676	E31-2170-05	JUMPING WIRE			
R677	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R678	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R679	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R680	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R681	RN14BK2C8200F	RES. METAL FILM	820	1%	1/6W
R682	RN14BK2C1601F	RES. METAL FILM	1.6K	1%	1/6W
R683	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R684	RD14BB2C300J	RES. CARBON	30	5%	1/6W
R685	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R686	RD14BB2C111J	RES. CARBON	110	5%	1/6W
R687	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R688	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R689	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R690	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R691	RN14BK2C6801F	RES. METAL FILM	6.8K	1%	1/6W
R701	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R702	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R703	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R704	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R705	RN14BK2C1601F	RES. METAL FILM	1.6K	1%	1/6W
R706	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R707	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R708	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R709	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R710	RN14BK2C1601F	RES. METAL FILM	1.6K	1%	1/6W
R711	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R712	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R713	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R714	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R801	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R802	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R803	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R811	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R812	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R821	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R822	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R901	RD14BB2C560J	RES. CARBON	56	5%	1/6W
R902	RD14BB2C560J	RES. CARBON	56	5%	1/6W
TC101	C05-0469-05	CAP. TRIMMER	10P		
TC201	C05-0469-05	CAP. TRIMMER	10P		
TC501	C05-0469-05	CAP. TRIMMER	10P		
TC502	C05-0469-05	CAP. TRIMMER	10P		
TC503	C05-0469-05	CAP. TRIMMER	10P		
TC504	C05-0469-05	CAP. TRIMMER	10P		

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
TH501	SDT100	THERMISTOR
U1	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH
U2	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH
U3	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH
U4	HD74LS42P	IC,BCD TO DECIMAL DECODER
U5	SN74ALS00AN	IC,QUAD 2 INPUT NAND GATE
U6	SN74ALS112AN	IC, DUAL J-K F.F.(WITH PR&CLR)
U7	SN74ALS00AN	IC,QUAD 2 INPUT NAND GATE
U8	SN74ALS112AN	IC, DUAL J-K F.F.(WITH PR&CLR)
U9	SN74ALS00AN	IC,QUAD 2 INPUT NAND GATE
U101	NJM4558D	IC,DUAL OP AMP
U102	KMC03	IC, LINEAR
U201	NJM4558D	IC,DUAL OP AMP
U202	KMC03	IC, LINEAR
VR101	R12-0569-05	RES. SEMI FIXED 100 B
VR102	R12-0569-05	RES. SEMI FIXED 100 B
VR103	R12-2520-05	RES. SEMI FIXED 5KB
VR104	R12-3543-05	RES. SEMI FIXED 20KB
VR201	R12-0569-05	RES. SEMI FIXED 100 B
VR202	R12-0569-05	RES. SEMI FIXED 100 B
VR203	R12-2520-05	RES. SEMI FIXED 5KB
VR204	R12-3543-05	RES. SEMI FIXED 20KB
VR501	R12-0570-05	RES. SEMI FIXED 200 B
VR502	R12-1538-05	RES. SEMI FIXED 1KB
VR503	R12-3543-05	RES. SEMI FIXED 20KB
VR504	R12-0570-05	RES. SEMI FIXED 200 B
VR505	R12-1538-05	RES. SEMI FIXED 1KB
VR506	R12-3543-05	RES. SEMI FIXED 20KB
VR507	R12-0570-05	RES. SEMI FIXED 200 B
VR508	R12-1538-05	RES. SEMI FIXED 1KB
VR509	R12-3543-05	RES. SEMI FIXED 20KB
VR510	R12-0570-05	RES. SEMI FIXED 200 B
VR511	R12-1538-05	RES. SEMI FIXED 1KB
VR512	R12-3543-05	RES. SEMI FIXED 20KB
VR513	R12-3543-05	RES. SEMI FIXED 20KB
VR601	R12-3543-05	RES. SEMI FIXED 20KB
VR602	R12-3543-05	RES. SEMI FIXED 20KB
VR603	R12-3543-05	RES. SEMI FIXED 20KB
VR604	R12-3543-05	RES. SEMI FIXED 20KB

HORIZONTAL UNIT

X74-1480-03

REF.NO	PARTS NO	NAME & DESCRIPTION
	J61-0408-05	WIRE WRAPPING BAND
	J73-0008-02	PCB (UNMOUNTED)
C1	CE04HW1H010M	CAP. ELECTRO 1 20% 50V
C2	NO USE	
C3	CC45CH1H030C	CAP. CERAMIC 3P 0.25P 50V
C4	NO USE	
C5	CQ92FM1M104K	
C6	CC45CH1H221J	CAP. CERAMIC 220P 5% 50V
C7	CC45FCH1H200J	CAP. CERAMIC 20P 5% 50V
C8	CF92V1H333J	CAP. PLASTIC FILM 0.033 5% 50V
C9	CF92V1H684J	CAP. PLASTIC FILM 0.68 5% 50V
C10	CF92V1H684J	CAP. PLASTIC FILM 0.68 5% 50V
C11	CE04EW1A470M	CAP. ELECTRO 47 20% 10V
C12	NO USE	
C13	CE04HW1H010M	CAP. ELECTRO 1 20% 50V
C14	CC45CH1H030C	CAP. CERAMIC 3P 0.25P 50V
C15	CC45FCH1H150J	CAP. CERAMIC 15P 5% 50V
C16	CQ92FM1M104K	
C17	CC45FCH1H200J	CAP. CERAMIC 20P 5% 50V
C18	CF92V1H333J	CAP. PLASTIC FILM 0.033 5% 50V
C19	CC45CH1H221J	CAP. CERAMIC 220P 5% 50V
C20	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C21	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C22	NO USE	
C23	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C24	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C25	NO USE	
C26	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C27	CK45FF1H103Z	CAP. CERAMIC 0.01 50V

REF.NO	PARTS NO	NAME & DESCRIPTION
C101	CC45FCH1H050C	CAP. CERAMIC 5P 0.25P 50V
C102	CK45FB1H222K	CAP. CERAMIC 2200P 10% 50V
C103	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C104	CC45FCH1H050C	CAP. CERAMIC 5P 0.25P 50V
C105	CK45FB1H222K	CAP. CERAMIC 2200P 10% 50V
C106	CK45B1H222K	CAP. CERAMIC 2200P 10% 50V
C107	CE04EW1A470M	CAP. ELECTRO 47 20% 10V
C108	CK45F1H103Z	CAP. CERAMIC 0.01 50V
C109	CC45FCH1H101J	CAP. CERAMIC 100P 5% 50V
C110	CM93BD2A101J	CAP. MICA 100P 5% 100V
C111	C91-1272-05	CAP. POLYESTER 1.5 5% 100V
C112	CE04EW1C220M	CAP. ELECTRO 22 20% 16V
C113	CE04EW1A470M	CAP. ELECTRO 47 20% 10V
C114	CE04EW1C220M	CAP. ELECTRO 22 20% 16V
C115	CC45FSL1H391J	CAP. CERAMIC 390P 5% 50V
C116	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C117	CF92V1H224J	CAP. POLYESTER 0.22 5% 50V
C118	CC45CH1H330J	CAP. CERAMIC 33P 5% 50V
C119	NO USE	
C120	CC45FCH1H470J	CAP. CERAMIC 47P 5% 50V
C121	CC45FCH1H680J	CAP. CERAMIC 68P 5% 50V
C122	CK45F1H103Z	CAP. CERAMIC 0.01 50V
C123	CC45FCH1H101J	CAP. CERAMIC 100P 5% 50V
C124	CM93BD2A101J	CAP. MICA 100P 5% 100V
C125	C91-1272-05	CAP. POLYESTER 1.5 5% 100V
C126	NO USE	
C127	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C128	CE04EW1A470M	CAP. ELECTRO 47 20% 10V
C129	CC45FCH1H470J	CAP. CERAMIC 47P 5% 50V
C130	CK45FB1H102K	CAP. CERAMIC 1000P 10% 50V
C131	CK45FB1H102K	CAP. CERAMIC 1000P 10% 50V
C132	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C133	CC45CH1H101J	CAP. CERAMIC 100P 5% 50V
C134	CE04EW1C330M	CAP. ELECTRO 33 20% 16V
C135	CE04EW1C330M	CAP. ELECTRO 33 20% 16V
C136	CE04HW1H010M	CAP. ELECTRO 1 20% 50V
C137	CE04EW1C220M	CAP. ELECTRO 22 20% 16V
C138	CC45FCH1H470J	CAP. CERAMIC 47P 5% 50V
C139	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C140	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C141	CC45FCH1H200J	CAP. CERAMIC 20P 5% 50V
C145	CK45B1H102K	CAP. CERAMIC 1000P 10% 50V
C302	CE04EW1A470M	CAP. ELECTRO 47 20% 10V
C303	NO USE	
C304	CC45CH1H470J	CAP. CERAMIC 47P 5% 50V
C305	CC45CH1H101J	CAP. CERAMIC 100P 5% 50V
C306	C90-0987-05	CAP. ELECTRO 1000 20% 6.3V
C310	CC45CH1H070D	CAP. CERAMIC 7P 0.5P 50V
C311	CC45FCH1H470J	CAP. CERAMIC 47P 5% 50V
C312	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C313	CC45FCH1H070D	CAP. CERAMIC 7P 0.5P 50V
C325	CE04EW1H2R2M	CAP. ELECTRO 2.2 20% 50V
C401	CC45CH1H680J	CAP. CERAMIC 68P 5% 50V
C402	CC45FCH1H910J	CAP. CERAMIC 91P 5% 50V
C403	CC45CH1H910J	CAP. CERAMIC 91P 5% 50V
C404	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C405	CC45FCH1H101J	CAP. CERAMIC 100P 5% 50V
C406	CE04EW1C100M	CAP. ELECTRO 10 20% 16V
C407	CC45FCH1H470J	CAP. CERAMIC 47P 5% 50V
C501	CQ92FM1M104K	
C502	CQ92FM1M104K	
C503	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C504	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C505	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C506	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C507	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C508	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C509	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C510	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C511	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C512	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C513	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C514	NO USE	
C515	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C516	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C517	CK45F1H103Z	CAP. CERAMIC 0.01 50V
C518	CK45FF1H103Z	CAP. CERAMIC 0.01 50V
C519	CE04EW1A101M	CAP. ELECTRO 100 20% 10V

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
C528	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C529	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C530	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C531	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C532	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C533	CE04EW1A101M	CAP. ELECTRO	100	20%	10V
C534	CE04EW1A101M	CAP. ELECTRO	100	20%	10V
C535	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C551	CE04EW1A471M	CAP. ELECTRO	470	20%	10V
C552	CE04EW1C331M	CAP. ELECTRO	330	20%	16V
C553	CE04EW1C331M	CAP. ELECTRO	330	20%	16V
C554	CE04EW1A102M	CAP. ELECTRO	1000	20%	10V
C555	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C556	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C557	CQ92FM1H103K	CAP. MYLAR	0.01	10%	50V
C558	CQ92FM1H103K	CAP. MYLAR	0.01	10%	50V
C801	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C802	CE04BW1H010M	CAP. ELECTRO	1	20%	50V
C803	CC45SL1H471J	CAP. CERAMIC	470P	5%	50V
C804	CC45SL1H471J	CAP. CERAMIC	470P	5%	50V
C805	CC45CH1H270J	CAP. CERAMIC	27P	5%	50V
C806	CQ92FM1H103K	CAP. MYLAR	0.01	10%	50V
C807	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C808	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C809	CC45FCH1H101J	CAP. CERAMIC	100P	5%	50V
C810	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C901	CC45CH1H470J	CAP. CERAMIC	47P	5%	50V
D2	1SS132	DIODE			
D3	MA700	DIODE			
D4	MA700	DIODE			
D5	MA700	DIODE			
D6	MA700	DIODE			
D7	MA700	DIODE			
D8	NO USE				
D9	1SS132	DIODE			
D10	MA700	DIODE			
D101	MA700	DIODE			
D102	MA700	DIODE			
D103	MA700	DIODE			
D104	MA700	DIODE			
D105	MA700	DIODE			
D106	MA700	DIODE			
D107	MA700	DIODE			
D108	MA700	DIODE			
D109	MA700	DIODE			
D110	MA700	DIODE			
D111	MA700	DIODE			
D112	1SS132	DIODE			
D113	1SS132	DIODE			
D114	NO USE				
D115	MA700	DIODE			
D116	MA700	DIODE			
D117	MA700	DIODE			
D118	1SS132	DIODE			
D119	1SS132	DIODE			
D120	1SS132	DIODE			
D121	NO USE				
D122	MA700	DIODE			
D123	MA700	DIODE			
D124	1S1587	DIODE			
D125	NO USE				
D126	1S1587	DIODE			
D127	NO USE				
D128	1SS132	DIODE			
D301	1SS132	DIODE			
D302	1SS132	DIODE			
D303	1SS132	DIODE			
D304	MA700	DIODE			
D305	1SS132	DIODE			
D306	MA700	DIODE			
D307	1SS132	DIODE			
D308	1SS132	DIODE			
D309	1SS132	DIODE			
D310	MA700	DIODE			
D311	MA700	DIODE			
D312	MA700	DIODE			
D313	MA700	DIODE			
D314	MA700	DIODE			
D315	1SS132	DIODE			
D316	1SS132	DIODE			

REF.NO	PARTS NO	NAME & DESCRIPTION		
D401	1SS132	DIODE		
D402	MA700	DIODE		
D801	1SS132	DIODE		
D802	1SS132	DIODE		
D803	1SS132	DIODE		
D804	MTZ3.3JA	DIODE, ZENER	3.27V	
D805	1SS132	DIODE		
D806	1SS132	DIODE		
D807	1SS132	DIODE		
D808	1SS132	DIODE		
D809	1SS132	DIODE		
JW1	E31-5572-05	WIRE ASS'Y		
K1	S51-1527-05	RELAY		
K2	S51-1527-05	RELAY		
L1	L40-1011-04	FERRI INDUCTOR	100UH	10%
L2	L40-2201-03	FERRI INDUCTOR	22UH	10%
L3	L40-2201-03	FERRI INDUCTOR	22UH	10%
P18	E40-7035-05	SOCKET	40P	
P101	E40-0711-05	PIN CONNECTOR	7P	
Q1	2SC3779(D)	TR. SI, NPN		
Q2	2SC3779(D)	TR. SI, NPN		
Q3	2SA1565	TR. SI, PNP		
Q4	2SK304(F)	FET, N-CHANNEL		
Q5	2SA1206	TR. SI, PNP		
Q6	2SC3779(D)	TR. SI, NPN		
Q7	2SA1206	TR. SI, PNP		
Q8	2SC2785(F)	TR. SI, NPN		
Q9	2SA1565	TR. SI, PNP		
Q10	2SK304(F)	FET, N-CHANNEL		
Q14	2SC3779(D)	TR. SI, NPN		
Q15	2SC3779(D)	TR. SI, NPN		
Q16	2SA1565	TR. SI, PNP		
Q17	2SA1206	TR. SI, PNP		
Q18	2SC3779(D)	TR. SI, NPN		
Q19	2SA1206	TR. SI, PNP		
Q20	2SC2785(F)	TR. SI, NPN		
Q101	2SC4049	TR. SI, NPN		
Q102	NO USE			
Q103	2SA1206	TR. SI, PNP		
Q104	2SC2785(F)	TR. SI, NPN		
Q105	2SC4049	TR. SI, NPN		
Q106	2SC4049	TR. SI, NPN		
Q107	2SC4049	TR. SI, NPN		
Q108	NO USE			
Q109	2SA1005(K)	TR. SI, PNP		
Q110	2SA1174(E,F)	TR. SI, PNP		
Q111	2SC3732(L)	TR. SI, NPN		
Q112	2SC3732(L)	TR. SI, NPN		
Q113	2SA1175(F)	TR. SI, PNP		
Q114	2SC3315(C)	TR. SI, NPN		
Q115	2SA1175(F)	TR. SI, PNP		
Q116	2SC3354(T,S)	TR. SI, NPN		
Q117	2SC3315(C)	TR. SI, NPN		
Q118	2SC2785(F)	TR. SI, NPN		
Q119	2SA1175(F)	TR. SI, PNP		
Q120	2SC2785(F)	TR. SI, NPN		
Q121	2SC3732(L)	TR. SI, NPN		
Q122	2SA1206	TR. SI, PNP		
Q123	2SC3315(C)	TR. SI, NPN		
Q124	2SA1206	TR. SI, PNP		
Q125	2SA1565	TR. SI, PNP		
Q126	2SA1206	TR. SI, PNP		
Q127	2SA1206	TR. SI, PNP		
Q128	2SA1005(K)	TR. SI, PNP		
Q129	2SA1174(E,F)	TR. SI, PNP		
Q130	2SC3732(L)	TR. SI, NPN		
Q131	2SC3732(L)	TR. SI, NPN		
Q132	2SA1175(F)	TR. SI, PNP		
Q133	2SC3315(C)	TR. SI, NPN		
Q134	2SC3354(T,S)	TR. SI, NPN		
Q135	2SC3315(C)	TR. SI, NPN		
Q136	2SC3732(L)	TR. SI, NPN		
Q137	2SC3732(L)	TR. SI, NPN		

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
Q301	2SA1175(F)	TR. SI, PNP			
Q302	2SC2785(F)	TR. SI, NPN			
Q303	2SC3315(C)	TR. SI, NPN			
Q304	2SC3315(C)	TR. SI, NPN			
Q305	2SC3315(C)	TR. SI, NPN			
Q306	2SC3315(C)	TR. SI, NPN			
Q307	2SC3315(C)	TR. SI, NPN			
Q308	2SC3315(C)	TR. SI, NPN			
Q309	2SC3315(C)	TR. SI, NPN			
Q310	2SA1565	TR. SI, PNP			
Q311	2SC3354(T,S)	TR. SI, NPN			
Q314	2SC3354(T,S)	TR. SI, NPN			
Q401	2SK583	FET, N-CHANNEL			
Q402	2SA1175(F)	TR. SI, PNP			
Q403	2SA1005(K)	TR. SI, PNP			
Q404	2SA1005(K)	TR. SI, PNP			
Q405	2SA1175(F)	TR. SI, PNP			
Q406	2SC2785(F)	TR. SI, NPN			
Q801	2SC2785(F)	TR. SI, NPN			
R1	RD14BB2C361J	RES. CARBON	360	5%	1/6W
R2	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R3	RN14BK2C3901F	RES. METAL FILM	3.9K	1%	1/6W
R4	RN14BK2C1600F	RES. METAL FILM	160	1%	1/6W
R5	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R6	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R7	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R8	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R9	RD14BB2C153J	RES. CARBON	15K	5%	1/6W
R10	RN14BK2C1003F	RES. METAL FILM	100K	1%	1/6W
R11	RN14BK2C1003F	RES. METAL FILM	100K	1%	1/6W
R12	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R13	RD14BB2C682J	RES. CARBON	6.8K	5%	1/6W
R14	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R15	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R16	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R17	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R18	RN14BK2C3301F	RES. METAL FILM	3.3K	1%	1/6W
R19	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R20	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R21	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R22	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R23	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R24	RN14BK2C1003F	RES. METAL FILM	100K	1%	1/6W
R25	RD14BB2C105J	RES. CARBON	1M	5%	1/6W
R26	RD14BB2C105J	RES. CARBON	1M	5%	1/6W
R27	RN14BK2C1003F	RES. METAL FILM	100K	1%	1/6W
R28	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R29	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R33	RD14BB2C754J	RES. CARBON	750K	5%	1/6W
R34	RD14BB2C754J	RES. CARBON	750K	5%	1/6W
R35	RD14BB2C105J	RES. CARBON	1M	5%	1/6W
R36	RD14BB2C105J	RES. CARBON	1M	5%	1/6W
R37	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R38	RD14BB2C361J	RES. CARBON	360	5%	1/6W
R39	RN14BK2C5100F	RES. METAL FILM	510	1%	1/6W
R40	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R41	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R42	RN14BK2C5100F	RES. METAL FILM	510	1%	1/6W
R43	RN14BK2C6801F	RES. METAL FILM	6.8K	1%	1/6W
R44	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R45	NO USE				
R46	RN14BK2C6801F	RES. METAL FILM	6.8K	1%	1/6W
R51	RD14BB2C361J	RES. CARBON	360	5%	1/6W
R52	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R53	RN14BK2C3901F	RES. METAL FILM	3.9K	1%	1/6W
R54	RN14BK2C1600F	RES. METAL FILM	160	1%	1/6W
R55	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R56	NO USE				
R57	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R58	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R59	RD14BB2C153J	RES. CARBON	15K	5%	1/6W
R60	RN14BK2C1003F	RES. METAL FILM	100K	1%	1/6W
R61	RN14BK2C1003F	RES. METAL FILM	100K	1%	1/6W
R62	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R63	RD14BB2C682J	RES. CARBON	6.8K	5%	1/6W
R64	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R65	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R66	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R67	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R68	RN14BK2C3301F	RES. METAL FILM	3.3K	1%	1/6W
R69	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R70	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R71	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R72	RD14BB2C181J	RES. CARBON	180	5%	1/6W
R73	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R74	RN14BK2C1003F	RES. METAL FILM	100K	1%	1/6W
R77	RN14BK2C1003F	RES. METAL FILM	100K	1%	1/6W
R78	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R79	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R80	RD14BB2C361J	RES. CARBON	360	5%	1/6W
R81	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R82	RD14BB2C153J	RES. CARBON	15K	5%	1/6W
R83	RD14BB2C153J	RES. CARBON	15K	5%	1/6W
R101	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R102	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R103	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R104	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R105	R90-0659-05	RES. NETWORK	4X510	5%	1/8W
R106	NO USE				
R107	RD14BB2C105J	RES. CARBON	1M	5%	1/6W
R108	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R109	R90-0660-05	RES. NETWORK	4X1K	5%	1/8W
R110	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R111	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R112	RD14BB2C751J	RES. CARBON	750	5%	1/6W
R113	RD14BB2C391J	RES. CARBON	390	5%	1/6W
R114	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R115	R90-0659-05	RES. NETWORK	4X510	5%	1/8W
R116	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R117	R90-0660-05	RES. NETWORK	4X1K	5%	1/8W
R118	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R119	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R120	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R121	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R122	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R123	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R124	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R125	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R126	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R127	R90-0658-05	RES. NETWORK			
R128	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R129	NO USE				
R130	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R131	NO USE				
R132	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R133	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R134	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R135	RD14BB2C241J	RES. CARBON	240	5%	1/6W
R136	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R137	RD14BB2C362J	RES. CARBON	3.6K	5%	1/6W
R138	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R139	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R140	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R141	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R142	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R143	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R144	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R145	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R146	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R147	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R148	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R149	RN14BK2C6801F	RES. METAL FILM	6.8K	1%	1/6W
R150	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R151	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R152	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R153	RN14BK2C4301F	RES. METAL FILM	4.3K	1%	1/6W
R154	RN14BK2C1152F	RES. METAL FILM	11.5K	1%	1/6W
R155	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R156	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R157	RD14BB2C563J	RES. CARBON	56K	5%	1/6W
R158	RN14BK2C9101F	RES. METAL FILM	9.1K	1%	1/6W
R159	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R160	RN14BK2C5601F	RES. METAL FILM	5.6K	1%	1/6W
R161	RN14BK2C9101F	RES. METAL FILM	9.1K	1%	1/6W
R162	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R163	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R164	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R165	RD14BB2C682J	RES. CARBON	6.8K	5%	1/6W
R166	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R167	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R168	RD14BB2C681J	RES. CARBON	680	5%	1/6W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R169	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R170	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R171	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R172	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R173	RD14BB2C271J	RES. CARBON	270	5%	1/6W
R174	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R175	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R176	RD14BB2C224J	RES. CARBON	220K	5%	1/6W
R177	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R178	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R179	RD14BB2C752J	RES. CARBON	7.5K	5%	1/6W
R180	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R181	RN14BK2C1102F	RES. METAL FILM	11K	1%	1/6W
R182	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R183	RN14BK2C1202F	RES. METAL FILM	12K	1%	1/6W
R184	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R185	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R186	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R187	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R188	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R189	RN14BK2C2401F	RES. METAL FILM	2.4K	1%	1/6W
R190	RN14BK2C2701F	RES. METAL FILM	2.7K	1%	1/6W
R191	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R192	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R193	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R194	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R195	R90-0658-05	RES. NETWORK			
R196	RD14BB2C123J	RES. CARBON	12K	5%	1/6W
R197	RN14BK2C8201F	RES. METAL FILM	8.2K	1%	1/6W
R198	RN14BK2C1601F	RES. METAL FILM	1.6K	1%	1/6W
R199	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R200	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R201	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R202	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R203	RD14BB2C241J	RES. CARBON	240	5%	1/6W
R204	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R205	RD14BB2C362J	RES. CARBON	3.6K	5%	1/6W
R206	RD14BB2C561J	RES. CARBON	560	5%	1/6W
R207	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R208	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R209	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R210	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R211	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R212	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R213	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R214	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R215	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R216	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R217	RN14BK2C4301F	RES. METAL FILM	4.3K	1%	1/6W
R218	RN14BK2C1302F	RES. METAL FILM	13K	1%	1/6W
R219	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R220	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R221	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R222	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R223	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R224	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R225	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R226	RD14BB2C123J	RES. CARBON	12K	5%	1/6W
R227	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R228	NO USE				
R229	RD14BB2C105J	RES. CARBON	1M	5%	1/6W
R301	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R302	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R305	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R306	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R307	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R308	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R309	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R310	NO USE				
R311	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R312	RN14BK2C3601F	RES. METAL FILM	3.6K	1%	1/6W
R313	RN14BK2C3601F	RES. METAL FILM	3.6K	1%	1/6W
R314	RD14BB2C203J	RES. CARBON	20K	5%	1/6W
R315	RD14BB2C273J	RES. CARBON	27K	5%	1/6W
R316	RD14BB2C273J	RES. CARBON	27K	5%	1/6W
R317	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R318	RN14BK2C1961F	RES. METAL FILM	1.96K	1%	1/6W
R319	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R320	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R321	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R322	RN14BK2C3301F	RES. METAL FILM	3.3K	1%	1/6W
R323	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R324	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R325	RD14BB2C164J	RES. CARBON	160K	5%	1/6W
R326	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R327	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R328	RD14BB2C131J	RES. CARBON	130	5%	1/6W
R329	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R330	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R331	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R332	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R333	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R334	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R335	RN14BK2C5602F	RES. METAL FILM	56K	1%	1/6W
R336	RN14BK2C1502F	RES. METAL FILM	15K	1%	1/6W
R337	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R338	NO USE				
R339	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R340	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R341	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R342	R90-0660-05	RES. NETWORK	4X1K	5%	1/8W
R343	RN14BK2C1001F	RES. METAL FILM	1K	1%	1/6W
R344	RN14BK2C2200F	RES. METAL FILM	220	1%	1/6W
R345	RN14BK2C5601F	RES. METAL FILM	5.6K	1%	1/6W
R346	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R347	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R348	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R349	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R350	RN14BK2C1801F	RES. METAL FILM	1.8K	1%	1/6W
R351	RN14BK2C2702F	RES. METAL FILM	27K	1%	1/6W
R352	RD14BB2C243J	RES. CARBON	24K	5%	1/6W
R353	RD14BB2C243J	RES. CARBON	24K	5%	1/6W
R354	RD14BB2C243J	RES. CARBON	24K	5%	1/6W
R355	RN14BK2C3301F	RES. METAL FILM	3.3K	1%	1/6W
R356	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R357	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R358	RD14BB2C202J	RES. CARBON	2K	5%	1/6W
R359	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R360	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R361	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R362	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R363	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R364	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R365	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R366	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R367	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R368	RN14BK2C1602F	RES. METAL FILM	16K	1%	1/6W
R369	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R370	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R371	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R372	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R373	RD14BB2C682J	RES. CARBON	6.8K	5%	1/6W
R374	RD14BB2C912J	RES. CARBON	9.1K	5%	1/6W
R401	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R402	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R403	NO USE				
R404	RD14BB2C512J	RES. CARBON	5.1K	5%	1/6W
R405	RD14BB2C752J	RES. CARBON	7.5K	5%	1/6W
R406	RD14BB2C432J	RES. CARBON	4.3K	5%	1/6W
R407	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R408	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R409	RD14BB2C273J	RES. CARBON	27K	5%	1/6W
R410	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R411	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R412	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R413	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R414	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R415	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R416	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R417	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R418	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R419	RD14BB2C331J	RES. CARBON	330	5%	1/6W
R420	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R421	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R422	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R423	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R801	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R802	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R803	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R804	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R805	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R806	RD14BB2C393J	RES. CARBON	39K	5%	1/6W
R807	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R808	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R809	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R810	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R811	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R812	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R813	RD14BB2C511J	RES. CARBON	510	5%	1/6W
R814	NO USE				
R815	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R816	RN14BK2C75R0F	RES. METAL FILM	75.0	1%	1/6W
R817	RD14BB2C910J	RES. CARBON	91	5%	1/6W
R901	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
TC101	C05-0446-05	CAP. TRIMMER	30P		
TC102	C05-0446-05	CAP. TRIMMER	30P		
TC302	C05-0468-05	CAP. TRIMMER	7P		
TC303	C05-0468-05	CAP. TRIMMER	7P		
TH1	SDT-20	THERMISTOR			
U1	MC10H102L	IC, QUAD 2-INPUT NOR GATE			
U2	MC10H102L	IC, QUAD 2-INPUT NOR GATE			
U3	MC10H131L	IC,DUAL D-FILP FLOP			
U4	MC10103L	IC, QUAD 2-INPUT OR GATE			
U5	SN74ALS74AN	IC,DUAL D-F.F. (WITH PR&CLR)			
U6	SN74ALS74AN	IC,DUAL D-F.F. (WITH PR&CLR)			
U7	SN74ALS74AN	IC,DUAL D-F.F. (WITH PR&CLR)			
U8	SN74ALS191N	IC,SYNC. U/D 4-BIT BINARY COUN			
U9	SN74ALS191N	IC,SYNC. U/D 4-BIT BINARY COUN			
U10	SN74ALS191N	IC,SYNC. U/D 4-BIT BINARY COUN			
U11	SN74ALS02N	IC,QUAD 2 INPUT NOR			
U12	SN74ALS32N	IC,QUAD 2 INPUT OR			
U13	SN74ALS08N	IC,QUAD 2 INPUT AND			
U14	SN74ALS32N	IC,QUAD 2 INPUT OR			
U15	SN74ALS02N	IC,QUAD 2 INPUT NOR			
U16	MC14052BCP	IC,DUAL 4-CH ANALOG MPX/DE-MPX			
U17	MC14052BCP	IC,DUAL 4-CH ANALOG MPX/DE-MPX			
U18	MC14052BCP	IC,DUAL 4-CH ANALOG MPX/DE-MPX			
U19	MC74HC4053AN	IC,TRIPLE 2CH ANALOG MPX/DE-MP			
U20	NO USE				
U21	NJM072S	IC,J-FET INPUT OP AMP			
U22	NJM072S	IC,J-FET INPUT OP AMP			
U23	NO USE				
U24	NJM072S	IC,J-FET INPUT OP AMP			
U25	NJM072S	IC,J-FET INPUT OP AMP			
U26	NJM072S	IC,J-FET INPUT OP AMP			
U27	NJM072S	IC,J-FET INPUT OP AMP			
U28	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH			
U29	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH			
U30	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH			
U31	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH			
U32	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH			
U101	2SK332(E)	FET, N-CHANNEL			
U102	2SC3066(F)	TR. DUAL, SI, NPN			
U103	2SK332(E)	FET, N-CHANNEL			
VR1	R12-3543-05	RES. SEMI FIXED 20KB			
VR2	NO USE				
VR3	R12-0571-05	RES. SEMI FIXED 500 B			
VR4	R12-3543-05	RES. SEMI FIXED 20KB			
VR101	R12-1538-05	RES. SEMI FIXED 1KB			
VR102	R12-2520-05	RES. SEMI FIXED 5KB			
VR103	NO USE				
VR104	R12-3543-05	RES. SEMI FIXED 20KB			
VR301	R12-1539-05	RES. SEMI FIXED 2KB			
VR302	R12-1539-05	RES. SEMI FIXED 2KB			
VR303	R12-0571-05	RES. SEMI FIXED 500 B			
VR304	R12-3453-05	RES. SEMI FIXED 10KB			
VR305	R12-3453-05	RES. SEMI FIXED 10KB			
VR306	R12-3453-05	RES. SEMI FIXED 10KB			
VR307	R12-0569-05	RES. SEMI FIXED 100 B			

PARTS LIST

ATT UNIT

X75-1180-01

REF.NO	PARTS NO	NAME & DESCRIPTION			
	E04-0260-05	BNC RECEPTACLE (READOUT)			
	J21-4612-14	BRACKET,FOR BNC			
	J25-5230-13	PCB (UNMOUNTED)			
	J30-0623-04	SPACER			
	N35-3006-41	SCREW, BINDING	M3X6		
C1	CE04EW1C471M	CAP. ELECTRO	470	20%	16V
C2	CE04EW1C471M	CAP. ELECTRO	470	20%	16V
C3	CE04EW1A221M	CAP. ELECTRO	220	20%	10V
C4	CE04EW1A221M	CAP. ELECTRO	220	20%	10V
C5	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C6	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C7	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C8	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C9	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C10	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C11	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C12	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C13	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C14	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C15	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C16	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C17	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C18	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C19	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C20	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C101	C91-0502-05	CAP. POLYESTER	0.01	20%	630V
C102	NO USE				
C103	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C104	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C105	NO USE				
C106	CC45FCH1H330J	CAP. CERAMIC	33P	5%	50V
C107	CC45FCH1H470J	CAP. CERAMIC	47P	5%	50V
C201	C91-0502-05	CAP. POLYESTER	0.01	20%	630V
C202	NO USE				
C203	CE04EW1C330M	CAP. ELECTRO	33	20%	16V
C204	CC45CH1H101J	CAP. CERAMIC	100P	5%	50V
C205	NO USE				
C206	CC45FCH1H330J	CAP. CERAMIC	33P	5%	50V
C207	CC45FCH1H470J	CAP. CERAMIC	47P	5%	50V
C301	CC45CH2H050C	CAP. CERAMIC	5P	0.25P	500V
C302	C91-0502-05	CAP. POLYESTER	0.01	20%	630V
C303	NO USE				
C304	CC45FCH1H030C	CAP. CERAMIC	3P	0.25P	50V
C305	CC45CH2H080D	CAP. CERAMIC	8P	0.5P	500V
C306	NO USE				
C307	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C350	CC45CH1H180J	CAP. CERAMIC	18P	5%	50V
C351	CC45CH1H220J	CAP. CERAMIC	22P	5%	50V
C401	CC45CH2H050C	CAP. CERAMIC	5P	0.25P	500V
C402	C91-0502-05	CAP. POLYESTER	0.01	20%	630V
C403	NO USE				
C404	CC45FCH1H030C	CAP. CERAMIC	3P	0.25P	50V
C405	CC45CH2H080D	CAP. CERAMIC	8P	0.5P	500V
C406	NO USE				
C407	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C450	CC45CH1H180J	CAP. CERAMIC	18P	5%	50V
C451	CC45CH1H220J	CAP. CERAMIC	22P	5%	50V
D1	1SS132	DIODE			
D2	1SS132	DIODE			
D101	1SS132	DIODE			
D102	1SS132	DIODE			
D201	1SS132	DIODE			
D202	1SS132	DIODE			
D301	1SS132	DIODE			
D302	1SS132	DIODE			
D303	1SS135	DIODE			
D401	1SS132	DIODE			
D402	1SS132	DIODE			
D403	1SS135	DIODE			

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
JW5	E38-0084-05	WIRE ASS'Y
JW6	E38-0085-05	WIRE ASS'Y
K301	S51-2508-05	RELAY
K401	S51-2508-05	RELAY
L1	L40-1011-03	FERRI INDUCTOR 100UH 10%
P4	E40-5066-05	PIN CONNECTOR 9P
P7	E40-3239-05	PIN CONNECTOR 4P
P8	E40-3239-05	PIN CONNECTOR 4P
P9	E40-3238-05	PIN CONNECTOR 3P
Q1	2SA1565	TR. SI, PNP
Q2	2SA1565	TR. SI, PNP
Q101	2SC3354(T,S)	TR. SI, NPN
Q102	2SC3354(T,S)	TR. SI, NPN
Q201	2SC3354(T,S)	TR. SI, NPN
Q202	2SC3354(T,S)	TR. SI, NPN
Q301	2SK241(GR)	FET, N-CHANNEL
Q302	2SK241(GR)	FET, N-CHANNEL
Q303	2SC3354(T,S)	TR. SI, NPN
Q304	2SC3779(D)	TR. SI, NPN
Q305	2SC3779(D)	TR. SI, NPN
Q306	2SC3354(T,S)	TR. SI, NPN
Q401	2SK241(GR)	FET, N-CHANNEL
Q402	2SK241(GR)	FET, N-CHANNEL
Q403	2SC3354(T,S)	TR. SI, NPN
Q404	2SC3779(D)	TR. SI, NPN
Q405	2SC3779(D)	TR. SI, NPN
Q406	2SC3354(T,S)	TR. SI, NPN
R1	RD14BB2C100J	RES. CARBON 10 5% 1/6W
R2	RD14BB2C100J	RES. CARBON 10 5% 1/6W
R3	RD14BB2C102J	RES. CARBON 1K 5% 1/6W
R4	RD14BB2C102J	RES. CARBON 1K 5% 1/6W
R5	RD14BB2C102J	RES. CARBON 1K 5% 1/6W
R6	RD14BB2C102J	RES. CARBON 1K 5% 1/6W
R7	RD14BB2C101J	RES. CARBON 100 5% 1/6W
R8	RD14BB2C101J	RES. CARBON 100 5% 1/6W
R9	RD14BB2C101J	RES. CARBON 100 5% 1/6W
R101	RN14BK2E1004D	RES. METAL FILM 1M 0.5% 1/4W
R102	RD14BB2C824J	RES. CARBON 820K 5% 1/6W
R103	RN14BK2C62R0F	RES. METAL FILM 62.0 1% 1/6W
R104	RN14BK2C62R0F	RES. METAL FILM 62.0 1% 1/6W
R105	R92-1431-15	RES. TEMP. COEFF: 330 5% 1/6W
R106	RN14BK2C5100F	RES. METAL FILM 510 1% 1/6W
R107	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R108	RN14BK2C1000F	RES. METAL FILM 100 1% 1/6W
R109	RN14BK2C1000F	RES. METAL FILM 100 1% 1/6W
R110	RD14BB2C221J	RES. CARBON 220 5% 1/6W
R111	RD14BB2C181J	RES. CARBON 180 5% 1/6W
R112	NO USE	
R113	RN14BK2C4300F	RES. METAL FILM 430 1% 1/6W
R114	RN14BK2C4301F	RES. METAL FILM 4.3K 1% 1/6W
R115	RN14BK2C3601F	RES. METAL FILM 3.6K 1% 1/6W
R116	RN14BK2C2401F	RES. METAL FILM 2.4K 1% 1/6W
R117	RN14BK2C7501F	RES. METAL FILM 7.5K 1% 1/6W
R118	RN14BK2C1501F	RES. METAL FILM 1.5K 1% 1/6W
R119	RN14BK2C7501F	RES. METAL FILM 7.5K 1% 1/6W
R120	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R121	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R122	RD14BB2C220J	RES. CARBON 22 5% 1/6W
R123	RD14BB2C220J	RES. CARBON 22 5% 1/6W
R124	NO USE	
R125	RD14BB2C220J	RES. CARBON 22 5% 1/6W
R126	RD14BB2C220J	RES. CARBON 22 5% 1/6W
R127	RN14BK2C3000F	RES. METAL FILM 300 1% 1/6W
R128	RN14BK2C3300F	RES. METAL FILM 330 1% 1/6W
R150	RD14BB2C220J	RES. CARBON 22 5% 1/6W
R201	RN14BK2E1004D	RES. METAL FILM 1M 0.5% 1/4W
R202	RD14BB2C824J	RES. CARBON 820K 5% 1/6W
R203	RN14BK2C62R0F	RES. METAL FILM 62.0 1% 1/6W
R204	RN14BK2C62R0F	RES. METAL FILM 62.0 1% 1/6W
R205	R92-1431-15	RES. TEMP. COEFF: 330 5% 1/6W
R206	RN14BK2C5100F	RES. METAL FILM 510 1% 1/6W
R207	RN14BK2C1003F	RES. METAL FILM 100K 1% 1/6W
R208	RN14BK2C1000F	RES. METAL FILM 100 1% 1/6W
R209	RN14BK2C1000F	RES. METAL FILM 100 1% 1/6W
R210	RD14BB2C221J	RES. CARBON 220 5% 1/6W
R211	RD14BB2C181J	RES. CARBON 180 5% 1/6W
R212	NO USE	
R213	RN14BK2C4300F	RES. METAL FILM 430 1% 1/6W
R214	RN14BK2C4301F	RES. METAL FILM 4.3K 1% 1/6W
R215	RN14BK2C3601F	RES. METAL FILM 3.6K 1% 1/6W
R216	RN14BK2C2401F	RES. METAL FILM 2.4K 1% 1/6W
R217	RN14BK2C7501F	RES. METAL FILM 7.5K 1% 1/6W
R218	RN14BK2C2401F	RES. METAL FILM 2.4K 1% 1/6W
R219	RN14BK2C7501F	RES. METAL FILM 7.5K 1% 1/6W
R220	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R221	RN14BK2C1001F	RES. METAL FILM 1K 1% 1/6W
R222	RD14BB2C220J	RES. CARBON 22 5% 1/6W
R223	RD14BB2C220J	RES. CARBON 22 5% 1/6W
R224	RD14BB2C682J	RES. CARBON 6.8K 5% 1/6W
R225	RD14BB2C220J	RES. CARBON 22 5% 1/6W
R226	RD14BB2C220J	RES. CARBON 22 5% 1/6W
R227	RN14BK2C3000F	RES. METAL FILM 300 1% 1/6W
R228	RN14BK2C3300F	RES. METAL FILM 330 1% 1/6W
R250	RD14BB2C220J	RES. CARBON 22 5% 1/6W
R301	RD14BB2E330J	RES. CARBON 33 5% 1/4W
R302	RD14BB2C560J	RES. CARBON 56 5% 1/6W
R303	R92-1433-05	RES. METAL FILM 800K 0.5% 1/2W
R304	R92-1432-05	RES. METAL FILM 250K 0.5% 1/2W
R305	RD14BB2C240J	RES. CARBON 24 5% 1/6W
R306	RN14BK2E1004D	RES. METAL FILM 1M 0.5% 1/4W
R307	RD14BB2C684J	RES. CARBON 680K 5% 1/6W
R308	RD14BB2C101J	RES. CARBON 100 5% 1/6W
R309	RD14BB2C201J	RES. CARBON 200 5% 1/6W
R310	RN14BK2C3900F	RES. METAL FILM 390 1% 1/6W
R311	RN14BK2C3900F	RES. METAL FILM 390 1% 1/6W
R312	RD14BB2C220J	RES. CARBON 22 5% 1/6W
R313	RD14BB2C510J	RES. CARBON 51 5% 1/6W
R314	RN14BK2C3601F	RES. METAL FILM 3.6K 1% 1/6W
R315	RN14BK2C3901F	RES. METAL FILM 3.9K 1% 1/6W
R316	RN14BK2C3900F	RES. METAL FILM 390 1% 1/6W
R317	NO USE	
R318	RD14BB2C510J	RES. CARBON 51 5% 1/6W
R319	RD14BB2C820J	RES. CARBON 82 5% 1/6W
R320	RD14BB2C220J	RES. CARBON 22 5% 1/6W
R350	RD14BB2C221J	RES. CARBON 220 5% 1/6W
R401	RD14BB2E330J	RES. CARBON 33 5% 1/4W
R402	RD14BB2C560J	RES. CARBON 56 5% 1/6W
R403	R92-1433-05	RES. METAL FILM 800K 0.5% 1/2W
R404	R92-1432-05	RES. METAL FILM 250K 0.5% 1/2W
R405	RD14BB2C240J	RES. CARBON 24 5% 1/6W
R406	RN14BK2E1004D	RES. METAL FILM 1M 0.5% 1/4W
R407	RD14BB2C684J	RES. CARBON 680K 5% 1/6W
R408	RD14BB2C101J	RES. CARBON 100 5% 1/6W
R409	RD14BB2C201J	RES. CARBON 200 5% 1/6W
R410	RN14BK2C3900F	RES. METAL FILM 390 1% 1/6W
R411	RN14BK2C3900F	RES. METAL FILM 390 1% 1/6W
R412	RD14BB2C220J	RES. CARBON 22 5% 1/6W
R413	RD14BB2C510J	RES. CARBON 51 5% 1/6W
R414	RN14BK2C3601F	RES. METAL FILM 3.6K 1% 1/6W
R415	RN14BK2C3901F	RES. METAL FILM 3.9K 1% 1/6W
R416	RN14BK2C3900F	RES. METAL FILM 390 1% 1/6W
R417	NO USE	
R418	RD14BB2C510J	RES. CARBON 51 5% 1/6W
R419	RD14BB2C820J	RES. CARBON 82 5% 1/6W
R420	RD14BB2C220J	RES. CARBON 22 5% 1/6W
R450	RD14BB2C221J	RES. CARBON 220 5% 1/6W
S101	S02-4511-15	ATTENUATOR UNIT
S201	S02-4511-15	ATTENUATOR UNIT
TC101	C05-0459-05	CAP. TRIMMER 10P
TC201	C05-0459-05	CAP. TRIMMER 10P
TC301	C05-0031-15	CAP. TRIMMER 10P
TC302	C05-0031-15	CAP. TRIMMER 10P
TC401	C05-0031-15	CAP. TRIMMER 10P
TC402	C05-0031-15	CAP. TRIMMER 10P

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION
U1	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH
U2	HD74HC595AP	IC, 8-BIT SHIFT REGISTER/LATCH
U101	DN1901	FET, DUAL, N-CHANNEL
U102	UPA101G	IC, NPN TRANSISTOR ARRAY
U201	DN1901	FET, DUAL, N-CHANNEL
U202	UPA101G	IC, NPN TRANSISTOR ARRAY
VR101	R12-3543-05	RES. SEMI FIXED 20KB
VR201	R12-3543-05	RES. SEMI FIXED 20KB

LINE COUNTER UNIT

X76-1400-00

REF.NO	PARTS NO	NAME & DESCRIPTION
	J73-0015-13	PCB (UNMOUNTED)
C1	CQ92M1H104K	CAP. MYLAR 0.1 10% 50V
C2	CE04EW1C470M	CAP. ELECTRO 47 20% 16V
C3	CE04EW1C470M	CAP. ELECTRO 47 20% 16V
C4	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C5	CE04EW1C470M	CAP. ELECTRO 47 20% 16V
C6	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C7	CC45FCH1H100D	CAP. CERAMIC 10P 0.5P 50V
C8	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C9	CE04BW1E220M	CAP. ELECTRO 22 20% 25V
C10	CE04BW1E220M	CAP. ELECTRO 22 20% 25V
C11	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C12	CE04EW1C470M	CAP. ELECTRO 47 20% 16V
C13	CE04EW1C470M	CAP. ELECTRO 47 20% 16V
C14	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C15	CQ92M1H104K	CAP. MYLAR 0.1 10% 50V
C16	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C17	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C18	CQ92FM1H682K	CAP. MYLAR 6800P 10% 50V
C19	CQ92FM1H154K	CAP. MYLAR 0.15 10% 50V
C20	CQ92FM1H103K	CAP. MYLAR 0.01 10% 50V
C21	CE04EW1H010M	CAP. ELECTRO 1 20% 50V
C22	CQ92FM1H102K	CAP. MYLAR 1000P 10% 50V
C23	CE04EW1H010M	CAP. ELECTRO 1 20% 50V
C24	CQ92M1H104K	CAP. MYLAR 0.1 10% 50V
C25	CE04EW1H010M	CAP. ELECTRO 1 20% 50V
C26	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C27	NO USE	
C28	CC45FSL1H221J	CAP. CERAMIC 220P 5% 50V
C29	CC45FCH1H101J	CAP. CERAMIC 100P 5% 50V
C101	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C801	CC45SL1H221J	CAP. CERAMIC 220P 5% 50V
D1	MA700	DIODE
D2	MTZ3.0JA	DIODE, ZENER 2.96V
D3	MTZ3.0JA	DIODE, ZENER 2.96V
D4	1SS132	DIODE
D5	1SS132	DIODE
D6	1SS132	DIODE
D7	1SS132	DIODE
D8	1SS132	DIODE
D9	1SS132	DIODE
D10	MA700	DIODE
D11	1SS132	DIODE
P34	E40-7121-05	PIN CONNECTOR 10P
P35	E40-3242-05	PIN CONNECTOR 7P
P36	E40-3238-05	PIN CONNECTOR 3P
P37	E40-3237-05	PIN CONNECTOR 2P
P38	E40-3238-05	PIN CONNECTOR 3P
P101	E40-0718-05	PIN CONNECTOR 7P
Q1	2SK241(GR)	FET, N-CHANNEL
Q2	2SK304(F)	FET, N-CHANNEL
Q3	2SC2785(F)	TR. SI, NPN
Q4	2SA1175(F)	TR. SI, PNP
Q5	2SC2785(F)	TR. SI, NPN
R1	RD14BB2C752J	RES. CARBON 7.5K 5% 1/6W
R2	RD14BB2C222J	RES. CARBON 2.2K 5% 1/6W
R3	RD14BB2C103J	RES. CARBON 10K 5% 1/6W
R4	RD14BB2C103J	RES. CARBON 10K 5% 1/6W
R5	RD14BB2C473J	RES. CARBON 47K 5% 1/6W
R6	RD14BB2C472J	RES. CARBON 4.7K 5% 1/6W
R7	RD14BB2C222J	RES. CARBON 2.2K 5% 1/6W
R8	RD14BB2C473J	RES. CARBON 47K 5% 1/6W
R9	RD14BB2C103J	RES. CARBON 10K 5% 1/6W
R10	RD14BB2C272J	RES. CARBON 2.7K 5% 1/6W
R11	RD14BB2C474J	RES. CARBON 470K 5% 1/6W
R12	RD14BB2C105J	RES. CARBON 1M 5% 1/6W
R13	RD14BB2C103J	RES. CARBON 10K 5% 1/6W
R14	RD14BB2C471J	RES. CARBON 470 5% 1/6W
R15	RD14BB2C473J	RES. CARBON 47K 5% 1/6W
R16	RD14BB2C473J	RES. CARBON 47K 5% 1/6W
R17	RD14BB2C684J	RES. CARBON 680K 5% 1/6W
R18	RD14BB2C473J	RES. CARBON 47K 5% 1/6W
R19	RD14BB2C473J	RES. CARBON 47K 5% 1/6W
R20	RD14BB2C473J	RES. CARBON 47K 5% 1/6W
R21	RD14BB2C473J	RES. CARBON 47K 5% 1/6W
R22	RD14BB2C103J	RES. CARBON 10K 5% 1/6W
R23	RD14BB2C274J	RES. CARBON 270K 5% 1/6W
R24	RD14BB2C333J	RES. CARBON 33K 5% 1/6W
R25	RD14BB2C334J	RES. CARBON 330K 5% 1/6W
R26	RD14BB2C102J	RES. CARBON 1K 5% 1/6W
R27	RD14BB2C103J	RES. CARBON 10K 5% 1/6W
R28	RD14BB2C683J	RES. CARBON 68K 5% 1/6W
R29	RD14BB2C103J	RES. CARBON 10K 5% 1/6W
R30	RD14BB2C103J	RES. CARBON 10K 5% 1/6W
R31	RD14BB2C103J	RES. CARBON 10K 5% 1/6W
R32	RD14BB2C473J	RES. CARBON 47K 5% 1/6W
R33	RD14BB2C101J	RES. CARBON 100 5% 1/6W
R101	RN14BK2C1202F	RES. METAL FILM 12K 1% 1/6W
R102	RN14BK2C1802F	RES. METAL FILM 18K 1% 1/6W
R103	RN14BK2C3002F	RES. METAL FILM 30K 1% 1/6W
R104	RD14BB2C222J	RES. CARBON 2.2K 5% 1/6W
R801	RD14BB2C101J	RES. CARBON 100 5% 1/6W
R802	RD14BB2C101J	RES. CARBON 100 5% 1/6W
U1	NJM072M	IC,DUAL J-FET INPUT OP-AMP
U2	UA733CNS	IC,VIDEO AMP
U3	LM1881M	IC,VIDEO SYNC SEPARATOR
U4	HD74HC221FP	IC,DUAL MONO. MULTIVIB.
U5	HD74HC123AFP	IC,DUAL RETRIGG. SINGLE SHOT
U6	MC74HC58F	IC,2 INPUT/3 INPUT AND-OR GATE
U7	HD74HC00FP	IC,QUAD 2 INPUT NAND GATE
U8	HD74HC595FP	IC,8-BIT SHIFT REGISTER/LATCH
U9	HD74HC123AFP	IC,DUAL RETRIGG. SINGLE SHOT
U10	HD74HC10FP	IC,TRIPLE 3 INPUT NAND GATE
U101	HD14052BFP	IC,DUAL 4-CH ANALOG MPX/DE-MPX

R/O UNIT

X77-1490-01

REF.NO	PARTS NO	NAME & DESCRIPTION
	E38-0206-05	LEAD WIRE WITH CONNECTOR
	J73-0009-12	PCB (UNMOUNTED)
B1	W09-0408-05	BATTERY,CR2354-1HF
C1	C91-0769-05	CAP. CERAMIC 0.01 20% 16V
C2	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C3	CC45FCH1H101J	CAP. CERAMIC 100P 5% 50V
C4	C91-0769-05	CAP. CERAMIC 0.01 20% 16V
C5	CC45FCH1H101J	CAP. CERAMIC 100P 5% 50V
C6	C91-0769-05	CAP. CERAMIC 0.01 20% 16V
C7	C91-0769-05	CAP. CERAMIC 0.01 20% 16V
C8	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C9	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C10	C91-0769-05	CAP. CERAMIC 0.01 20% 16V
C11	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C12	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C13	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C14	C91-0769-05	CAP. CERAMIC 0.01 20% 16V
C15	CQ92FM1H104K	CAP. MYLAR 0.1 10% 50V
C16	C91-0769-05	CAP. CERAMIC 0.01 20% 16V
C17	CC45FCH1H220J	CAP. CERAMIC 22P 5% 50V

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
C18	CC45FCH1H220J	CAP. CERAMIC	22P	5%	50V
C19	CE04EW1C220M	CAP. ELECTRO	22	20%	16V
C20	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C21	C91-0769-05	CAP. CERAMIC	0.01	20%	16V
C22	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C23	C91-0769-05	CAP. CERAMIC	0.01	20%	16V
C24	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C25	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C26	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C27	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C28	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C29	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C30	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C31	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C32	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C33	C91-0769-05	CAP. CERAMIC	0.01	20%	16V
C34	CC45FCH1H101J	CAP. CERAMIC	100P	5%	50V
C35	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C36	CE04EW1C220M	CAP. ELECTRO	22	20%	16V
C37	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C38	CC45FCH1H101J	CAP. CERAMIC	100P	5%	50V
C39	CE04EW1C331M	CAP. ELECTRO	330	20%	16V
C40	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C41	CE04EW1E470M	CAP. ELECTRO	47	20%	25V
C42	CC45FSL1H471J	CAP. CERAMIC	470P	5%	50V
C43	CE04EW1A471M	CAP. ELECTRO	470	20%	10V
C44	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C45	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C48	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C49	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C50	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C51	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C52	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C53	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C54	CQ92M1H104K	CAP. MYLAR	0.1	10%	50V
C55	CC45FCH1H101J	CAP. CERAMIC	100P	5%	50V
C56	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C57	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C58	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C59	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C60	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C61	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C62	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C63	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C64	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C65	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C66	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C67	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C68	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C69	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C70	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C71	CC45FCH1H101J	CAP. CERAMIC	100P	5%	50V
C72	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C73	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C74	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C75	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C76	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C77	CE04EW1C471M	CAP. ELECTRO	470	20%	16V
C78	CE04EW1C471M	CAP. ELECTRO	470	20%	16V
C79	C91-1273-05	CAP. NETWORK	6X0.01		50V
C80	CE04EW1A102M	CAP. ELECTRO	1000	20%	10V
C81	NO USE				
C82	CK45B1H102K	CAP. CERAMIC	1000P	10%	50V
C86	C91-0769-05	CAP. CERAMIC	0.01	20%	16V
C87	CQ92M1H104K	CAP. MYLAR	0.1	10%	50V
C88	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C89	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C90	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C91	CC45FSL1H471J	CAP. CERAMIC	470P	5%	50V
C92	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C901	C91-0745-05	CAP. CERAMIC	100P	10%	50V
D1	1SS132	DIODE			
D2	1SS132	DIODE			
D3	1SS132	DIODE			
D4	1SS132	DIODE			
D5	MTZ12JC	DIODE, ZENER	12.05V		
D6	1SS132	DIODE			
D7	1SS132	DIODE			
L1	L40-1011-03	FERRI INDUCTOR	100UH	10%	
L2	L40-1021-03	FERRI INDUCTOR	1MH	10%	
L3	L40-1092-03	FERRI INDUCTOR	1UH	20%	
L4	L40-1011-03	FERRI INDUCTOR	100UH	10%	
P1	E40-7036-05	PIN CONNECTOR	20P		
P2	E40-7037-05	PIN CONNECTOR	26P		
P3	E40-7035-05	SOCKET	40P		
P4	E40-5066-05	PIN CONNECTOR	9P		
Q1	2SA1175(F)	TR. SI, PNP			
Q2	2SC1384(R,S)	TR. SI, NPN			
R1	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R2	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R3	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R4	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R5	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R6	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R7	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R8	NO USE				
R9	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R10	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R11	RD14BB2C243J	RES. CARBON	24K	5%	1/6W
R12	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R13	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R14	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R15	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R16	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R17	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R18	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R19	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R20	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R21	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R22	RN14BK2C1002F	RES. METAL FILM	10K	1%	1/6W
R23	RD14BB2C474J	RES. CARBON	470K	5%	1/6W
R24	RD14BB2C472J	RES. CARBON	4.7K	5%	1/6W
R25	RN14BK2C9100F	RES. METAL FILM	910	1%	1/6W
R26	RN14BK2C3302F	RES. METAL FILM	33K	1%	1/6W
R27	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R28	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R29	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R30	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R31	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R32	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R33	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R34	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R35	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R36	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R37	RN14BK2C2400F	RES. METAL FILM	240	1%	1/6W
R38	RN14BK2C1801F	RES. METAL FILM	1.8K	1%	1/6W
R39	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R40	RN14BK2C1801F	RES. METAL FILM	1.8K	1%	1/6W
R41	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R42	RN14BK2C2400F	RES. METAL FILM	240	1%	1/6W
R43	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R44	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R45	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R46	NO USE				
R47	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R48	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R49	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R50	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R51	RD14BB2C134J	RES. CARBON	130K	5%	1/6W
R52	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R53	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R54	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R55	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R58	R90-0662-05	RES. NETWORK			
R59	R90-0661-05	RES. NETWORK	4X100K		
R60	RD14BB2C471J	RES. CARBON	470	5%	1/6W
R61	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R62	R90-0663-05	RES. NETWORK	8X1M		
R63	NO USE				
R64	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R65	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R66	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R67	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R68	NO USE				
R69	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R70	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R71	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R72	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R73	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R74	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R75	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R76	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
R77	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R78	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R79	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R80	NO USE				
R81	RN14BK2C2001F	RES. METAL FILM	2K	1%	1/6W
R82	RD14BB2C622J	RES. CARBON	6.2K	5%	1/6W
R83	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R84	NO USE				
R85	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R86	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R87	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R88	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R89	RD14BB2C912J	RES. CARBON	9.1K	5%	1/6W
R90	R90-0286-05	RES. NETWORK	4X4.7K		
R91	R90-0415-05	RES. NETWORK	3X4.7K		
R92	R90-0286-05	RES. NETWORK	4X4.7K		
R256	R92-1061-05	JUMPING RES.	ZERO OHM (5MM)		
U1	MB8464A-15LL	IC,64K-BIT SRAM			
U2	MBM27C256*T	IC,256K-BIT EPROM			
U3	MSM6242BGS-VK	IC,REAL TIME CLOCK			
U4	PST518B	IC,RESET			
U5	LH0080A	IC,CPU			
U6	DTM-5010	IC, GATE ARRAY			
U7	HD74LS138FP	IC,3-TO-8 DEMULTIPLEXER			
U8	HD74HC238FP	IC,3-TO-8 LINE DECODER			
U9	HD74HC238FP	IC,3-TO-8 LINE DECODER			
U10	HD74HC107FP	IC,DUAL J-K FLIP-FLOP			
U11	HD74LS04FP	IC,HEX INVERTERS			
U12	HD74LS244FP	IC,OCTAL 3-STATE BUS BUFFER			
U13	HD74LS244FP	IC,OCTAL 3-STATE BUS BUFFER			
U14	HD74LS04FP	IC,HEX INVERTERS			
U15	HD74LS30FP	IC,8-INPUT NAND			
U16	HD74LS374FP	IC,OCTAL 3-STATE D-FF			
U17	HD74LS244FP	IC,OCTAL 3-STATE BUS BUFFER			
U18	HD74LS244FP	IC,OCTAL 3-STATE BUS BUFFER			
U19	HD14066BFP	IC,QUAD BILATERAL SWITCH			
U20	HD74LS107AFP	IC,QUAD JK-FF WITH CLEAR			
U21	HD74LS107AFP	IC,QUAD JK-FF WITH CLEAR			
U22	HD74LS107AFP	IC,QUAD JK-FF WITH CLEAR			
U23	HD74LS107AFP	IC,QUAD JK-FF WITH CLEAR			
U24	HD74LS30FP	IC,8-INPUT NAND			
U25	HD74LS11FP	IC,TRIPLE 3-INPUT AND			
U26	NJM555M	IC,TIMER			
U27	HD74LS157FP	IC,2 TO 1 DATA SELECTORS			
U28	HD74LS157FP	IC,2 TO 1 DATA SELECTORS			
U29	HD74HC08FP	IC,QUAD 2-INPUT AND GATE			
U30	HD74HC7266FP	IC,QUAD 2-INPUT NOR GATE			
U31	HD74HC08FP	IC,QUAD 2-INPUT AND GATE			
U32	MBM27C64*V	IC,64K-BIT EPROM			
U33	CTM5020	IC,GATE ARRAY	OP		0V
U34	HD14051BFP	IC,8-CH ANALOG MPX/DE-MPX			
U35	NJM311M	IC,VOLTAGE COMPARATOR			
U36	HD74HC174FP	IC,HEX D-TYPE FLIP-FLOP			
U37	AM6012DC	IC,12-BIT D/A CONVERTER			
U38	HD74HC564FP	IC,OCTAL D-TYPE FLIP-FLOP			
U39	HD74HC244FP	IC,OCTAL BUS BUFFER			
U40	HD14052BFP	IC,DUAL 4-CH ANALOG MPX/DE-MPX			
U41	HD14051BFP	IC,8-CH ANALOG MPX/DE-MPX			
U42	DAC0808LCN	IC,8-BIT D/A CONVERTER			
U43	HD14052BFP	IC,DUAL 4-CH ANALOG MPX/DE-MPX			
U44	NJM072M	IC,DUAL J-FET INPUT OP-AMP			
U45	NJM072M	IC,DUAL J-FET INPUT OP-AMP			
U46	NJM072M	IC,DUAL J-FET INPUT OP-AMP			
U47	NJM072M	IC,DUAL J-FET INPUT OP-AMP			
X1	L78-0107-05	CERAMIC RESONATOR (10MHZ)			
X2	L77-1229-05	CRYSTAL RESONATOR			

CONNECTION UNIT

X77-1500-01

REF.NO	PARTS NO	NAME & DESCRIPTION	
	J73-0012-03	PCB (UNMOUNTED)	
P3	E40-7034-05	PIN CONNECTOR	40P
P10	E40-7036-05	PIN CONNECTOR	20P
P11	NO USE		
P12	E38-0072-05	LEAD WIRE WITH CONNECTOR	10P
P13	E38-0071-05	LEAD WIRE WITH CONNECTOR	6P
P17	E38-0073-05	LEAD WIRE WITH CONNECTOR	11P
P18	E40-7034-05	PIN CONNECTOR	40P
P19	E38-0074-05	LEAD WIRE WITH CONNECTOR	12P
P34	E40-7122-05	PIN CONNECTOR	10P

FINAL UNIT

X80-1100-03

REF.NO	PARTS NO	NAME & DESCRIPTION			
	F01-0866-04	HEAT SINK			
	F02-0502-04	HEAT SINK			
	J25-5196-13	PCB (UNMOUNTED)			
	N09-0718-05	SCREW, SEMS PAN HD			
	N89-3008-41	SCREW, BINDING TAPTITE 3X8			
C1	CK45FB1H102K	CAP. CERAMIC	1000P	10%	50V
C2	C91-1275-05	CAP. ELECTRO	33000		5.5V
C3	C91-1275-05	CAP. ELECTRO	33000		5.5V
C4	CQ92FM1H472K	CAP. MYLAR	4700P	10%	50V
C5	CE04BW1H010M	CAP. ELECTRO	1	20%	50V
C6	CC45CH1H330J	CAP. CERAMIC	33P	5%	50V
C7	CC45FCH1H070D	CAP. CERAMIC	7P	0.5P	50V
C8	NO USE				
C9	CC45CH1H330J				
C10	CC45CH1H390J				
C11	CQ92M1H104K	CAP. MYLAR	0.1	10%	50V
C12	CQ92M1H104K	CAP. MYLAR	0.1	10%	50V
C13	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C14	CC45SL1H561J	CAP. CERAMIC	560P	5%	50V
C15	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C103	CC45FCH1H020C	CAP. CERAMIC	2P	0.25P	50V
C104	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C105	CK45FB2H472K	CAP. CERAMIC	4700P	10%	500V
C108	CC45FCH1H070D	CAP. CERAMIC	7P	0.5P	50V
C109	CC45FCH2H020C	CAP. CERAMIC	2P	0.25P	500V
C110	CC45FCH2H0R5C	CAP. CERAMIC	0.5P	0.25P	500V
C111	CF93AN2E103K	CAP. METAL FILM	0.01	10%	250V
C112	CF93AN2E103K	CAP. METAL FILM	0.01	10%	250V
C113	CF93AN2E104K	CAP. METAL FILM	0.1	10%	250V
C114	CF93AN2E104K	CAP. METAL FILM	0.1	10%	250V
C115	CC45CH1H040C				
C116	CE04BW1E220M	CAP. ELECTRO	22	20%	25V
C301	CE04EW1C331M	CAP. ELECTRO	330	20%	16V
C302	CE04EW1C331M	CAP. ELECTRO	330	20%	16V
C303	CE04EW1E101M	CAP. ELECTRO	100	20%	25V
C304	CE04EW2A220M	CAP. ELECTRO	22	20%	100V
C305	CE04W2E4R7M	CAP. ELECTRO	4.7	20%	250V
C306	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C307	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C308	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C309	CQ92FM1H104K	CAP. MYLAR	0.1	10%	50V
C310	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C311	CK45FF1H103Z	CAP. CERAMIC	0.01		50V
C312	CK45FB2H472K	CAP. CERAMIC	4700P	10%	500V
C313	CK45FB2H472K	CAP. CERAMIC	4700P	10%	500V
C314	CK45FB2H472K	CAP. CERAMIC	4700P	10%	500V
C801	CC45CH1H120J	CAP. CERAMIC	12P	5%	50V
C901	CQ92M1H102K	CAP. MYLAR	1000P	10%	50V
D1	1SS132	DIODE			
D2	1SS132	DIODE			
D101	TLR112	LED,RED			
D102	MA700	DIODE			

PARTS LIST

REF.NO	PARTS NO	NAME & DESCRIPTION			
D105	MA700	DIODE			
D106	TLR112	LED,RED			
D107	1SS132	DIODE			
D108	1SS132	DIODE			
D201	1SS132	DIODE			
D202	1SS132	DIODE			
L1	L33-0806-05	CHOKE COIL (0.52UH)			
L2	L33-0806-05	CHOKE COIL (0.52UH)			
L3	L33-0806-05	CHOKE COIL (0.52UH)			
L4	L33-0806-05	CHOKE COIL (0.52UH)			
L5	L40-2202-70	FERRI INDUCTOR	22UH	20%	
P11	E40-3238-05	PIN CONNECTOR	3P		
P12	E40-5067-05	PIN CONNECTOR	10P		
P13	E40-3241-05	PIN CONNECTOR	6P		
P14	E40-3238-05	PIN CONNECTOR	3P		
P15	E40-3238-05	PIN CONNECTOR	3P		
Q1	2SC3779(D)	TR. SI, NPN			
Q2	2SC3779(D)	TR. SI, NPN			
Q3	2SC3779(D)	TR. SI, NPN			
Q4	2SC3779(D)	TR. SI, NPN			
Q5	2SA1161	TR. SI, PNP			
Q6	2SA1161	TR. SI, PNP			
Q7	2SC3779(D)	TR. SI, NPN			
Q8	2SC3779(D)	TR. SI, NPN			
Q9	2SC3779(D)	TR. SI, NPN			
Q10	2SC3779(D)	TR. SI, NPN			
Q11	2SC3779(D)	TR. SI, NPN			
Q12	2SC3779(D)	TR. SI, NPN			
Q13	2SC1164(O)*S	TR. SI, NPN			
Q14	2SC1164(O)*S	TR. SI, NPN			
Q101	2SA1005(K)	TR. SI, PNP			
Q102	2SA1005(K)	TR. SI, PNP			
Q103	2SC3315(C)	TR. SI, NPN			
Q104	2SC3315(C)	TR. SI, NPN			
Q105	2SA1005(K)	TR. SI, PNP			
Q106	2SA1005(K)	TR. SI, PNP			
Q107	2SA1005(K)	TR. SI, PNP			
Q108	2SA1005(K)	TR. SI, PNP			
Q109	2SC3354(T,S)	TR. SI, NPN			
Q110	2SC3354(T,S)	TR. SI, NPN			
Q111	2SA1206	TR. SI, PNP			
Q112	2SC3354(T,S)	TR. SI, NPN			
Q113	2SC3354(T,S)	TR. SI, NPN			
Q114	2SC3600(E,F)	TR. SI, NPN			
Q115	2SC3600(E,F)	TR. SI, NPN			
Q116	2SA1406(E,F)	TR. SI, PNP			
Q117	2SA1406(E,F)	TR. SI, PNP			
Q201	2SC3315(C)	TR. SI, NPN			
Q202	2SC3315(C)	TR. SI, NPN			
Q203	2SC3354(T,S)	TR. SI, NPN			
Q204	2SC3354(T,S)	TR. SI, NPN			
Q205	2SC2785(F)	TR. SI, NPN			
Q206	2SC3315(C)	TR. SI, NPN			
Q207	2SC3315(C)	TR. SI, NPN			
Q208	2SC3354(T,S)	TR. SI, NPN			
Q209	2SC3354(T,S)	TR. SI, NPN			
Q210	2SC2785(F)	TR. SI, NPN			
R1	RN14BK2C1000F	RES. METAL FILM	100	1%	1/6W
R2	RN14BK2C1000F	RES. METAL FILM	100	1%	1/6W
R3	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R4	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R5	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R6	RD14BB2C432J	RES. CARBON	4.3K	5%	1/6W
R7	RD14BB2C432J	RES. CARBON	4.3K	5%	1/6W
R8	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R9	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R10	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R11	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R12	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R13	RD14BB2C303J	RES. CARBON	30K	5%	1/6W
R14	RD14BB2C753J	RES. CARBON	75K	5%	1/6W
R15	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R16	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R17	RN14BK2C2700F	RES. METAL FILM	270	1%	1/6W
R18	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R19	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R20	RN14BK2C3000F	RES. METAL FILM	300	1%	1/6W
R21	RN14BK2C3000F	RES. METAL FILM	300	1%	1/6W
R22	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R23	RD14BB2C681J	RES. CARBON	680	5%	1/6W
R24	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R25	RN14BK2C2201F	RES. METAL FILM	2.2K	1%	1/6W
R26	RN14BK2C2201F	RES. METAL FILM	2.2K	1%	1/6W
R27	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R28	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R29	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R30	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R31	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R32	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R33	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R34	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R35	RN14BK2E82R0F	RES. METAL FILM	82.0	1%	1/4W
R36	RN14BK2E82R0F	RES. METAL FILM	82.0	1%	1/4W
R37	RN14BK2C1500F	RES. METAL FILM	150	1%	1/6W
R38	R92-1191-05	RES. THERMAL COEFF.	1.8K		3000P
R39	RD14BB2C513J	RES. CARBON	51K	5%	1/6W
R40	RD14BB2C240J	RES. CARBON	24	5%	1/6W
R41	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R42	RD14BB2C680J	RES. CARBON	68	5%	1/6W
R43	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R44	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R45	RD14BB2E220J	RES. CARBON	22	5%	1/4W
R46	RD14BB2E220J	RES. CARBON	22	5%	1/4W
R47	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R48	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R49	NO USE				
R50	R92-1420-05	RES. METAL FILM	510	5%	7W
R51	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R52	R92-1420-05	RES. METAL FILM	510	5%	7W
R53	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R54	NO USE				
R55	RD14BB2C361J	RES. CARBON	360	5%	1/6W
R56	RD14BB2C361J	RES. CARBON	360	5%	1/6W
R59	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R101	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R102	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R103	RN14BK2C4300F	RES. METAL FILM	430	1%	1/6W
R104	RN14BK2C4300F	RES. METAL FILM	430	1%	1/6W
R105	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R106	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R107	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R108	RN14BK2C5101F	RES. METAL FILM	5.1K	1%	1/6W
R109	RN14BK2C1201F	RES. METAL FILM	1.2K	1%	1/6W
R110	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R111	RN14BK2C3001F	RES. METAL FILM	3K	1%	1/6W
R112	RD14BB2C151J	RES. CARBON	150	5%	1/6W
R113	RD14BB2C431J	RES. CARBON	430	5%	1/6W
R114	RD14BB2C431J	RES. CARBON	430	5%	1/6W
R115	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R116	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R117	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R118	RN14BK2C6800F	RES. METAL FILM	680	1%	1/6W
R119	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R120	RN14BK2C3901F	RES. METAL FILM	3.9K	1%	1/6W
R121	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R122	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R123	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R124	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R125	RN14BK2C1501F	RES. METAL FILM	1.5K	1%	1/6W
R126	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R127	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R128	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R129	RD14BB2C392J	RES. CARBON	3.9K	5%	1/6W
R130	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R131	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R132	RN14BK2C1301F	RES. METAL FILM	1.3K	1%	1/6W
R133	RN14BK2C1301F	RES. METAL FILM	1.3K	1%	1/6W
R134	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R135	NO USE				
R136	RD14BB2C514J	RES. CARBON	510K	5%	1/6W
R137	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R138	RD14BB2C242J	RES. CARBON	2.4K	5%	1/6W
R139	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R140	RD14BB2C222J	RES. CARBON	2.2K	5%	1/6W
R141	RD14BB2C152J	RES. CARBON	1.5K	5%	1/6W
R142	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R143	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R144	RN14BK2E2002F	RES. METAL FILM	20K	1%	1/4W
R145	RN14BK2E2002F	RES. METAL FILM	20K	1%	1/4W
R146	R92-1434-05	RES. SPECIAL POWER	47K	5%	1/2W
R147	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W

PARTS LIST

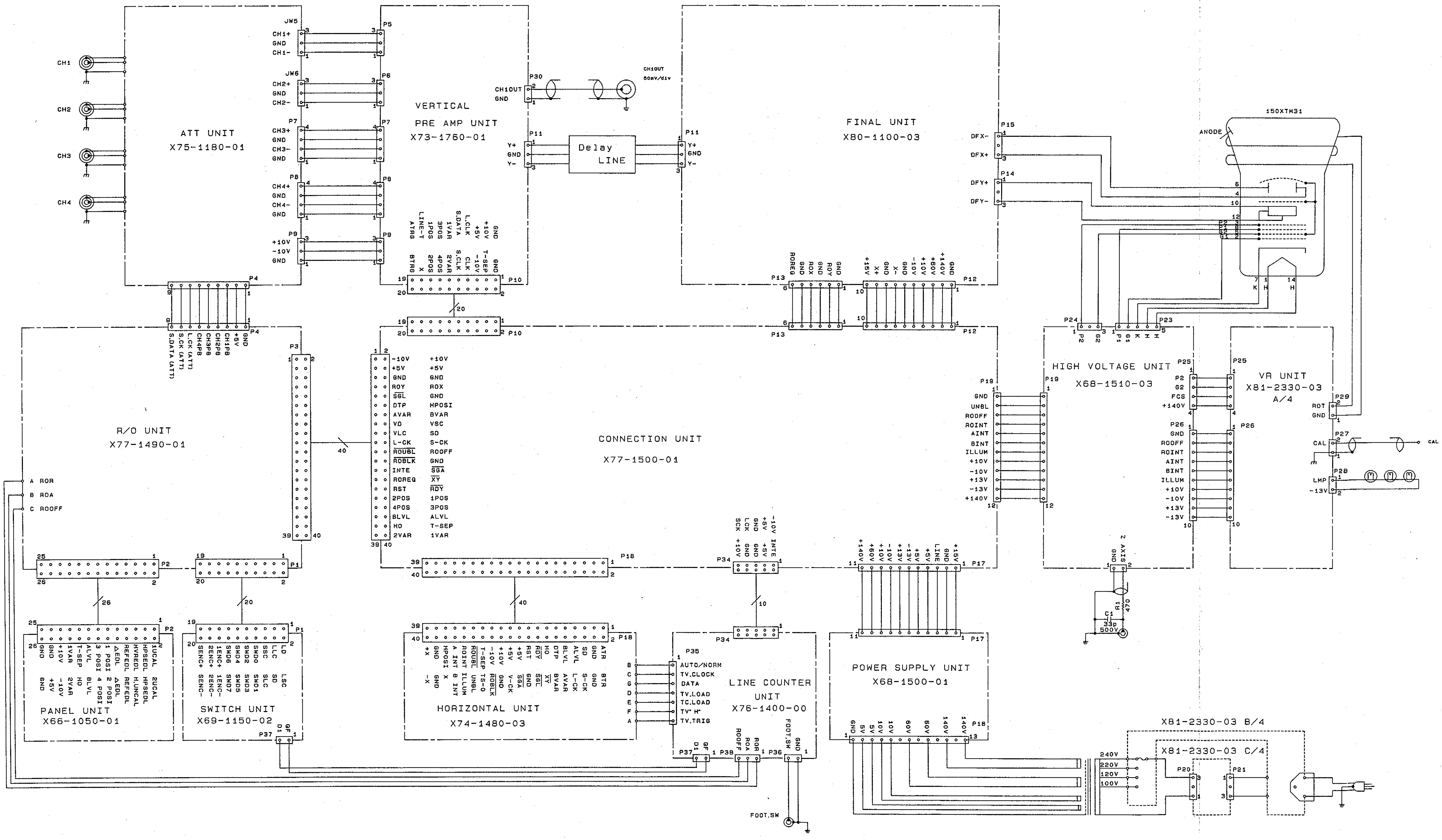
REF.NO	PARTS NO	NAME & DESCRIPTION			
R148	RN14BK2C3601F	RES. METAL FILM	3.6K	1%	1/6W
R149	RN14BK2C4702F	RES. METAL FILM	47K	1%	1/6W
R150	RN14BK2C4702F	RES. METAL FILM	47K	1%	1/6W
R151	RN14BK2C3601F	RES. METAL FILM	3.6K	1%	1/6W
R152	RN14BK2C7500F	RES. METAL FILM	750	1%	1/6W
R153	RN14BK2E2002F	RES. METAL FILM	20K	1%	1/4W
R154	RN14BK2E2002F	RES. METAL FILM	20K	1%	1/4W
R155	R92-1434-05	RES. SPECIAL POWER	47K	5%	1/2W
R156	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R157	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R158	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R159	RD14BB2C470J	RES. CARBON	47	5%	1/6W
R160	RD14BB2C223J	RES. CARBON	22K	5%	1/6W
R161	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R162	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R163	NO USE				
R164	RD14BB2C203J	RES. CARBON	20K	5%	1/6W
R201	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R202	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R203	RN14BK2C1200F	RES. METAL FILM	120	1%	1/6W
R204	RN14BK2C1200F	RES. METAL FILM	120	1%	1/6W
R205	RD14BB2C621J	RES. CARBON	620	5%	1/6W
R206	RD14BB2C623J	RES. CARBON	62K	5%	1/6W
R207	RD14BB2C912J	RES. CARBON	9.1K	5%	1/6W
R208	RD14BB2C301J	RES. CARBON	300	5%	1/6W
R209	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R210	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R211	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R212	RN14BK2C5001F				
R213	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R214	RN14BK2C1800F	RES. METAL FILM	180	1%	1/6W
R215	RD14BB2C301J	RES. CARBON	300	5%	1/6W
R216	RD14BB2C821J	RES. CARBON	820	5%	1/6W
R217	RN14BK2C3300F	RES. METAL FILM	330	1%	1/6W
R218	RN14BK2C3300F	RES. METAL FILM	330	1%	1/6W
R219	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R220	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R221	RD14BB2C912J	RES. CARBON	9.1K	5%	1/6W
R222	RD14BB2C301J	RES. CARBON	300	5%	1/6W
R223	RD14BB2C302J	RES. CARBON	3K	5%	1/6W
R224	RD14BB2C332J	RES. CARBON	3.3K	5%	1/6W
R225	RD14BB2C562J	RES. CARBON	5.6K	5%	1/6W
R226	RN14BK2C9101F	RES. METAL FILM	9.1K	1%	1/6W
R227	RN14BK2C4701F	RES. METAL FILM	4.7K	1%	1/6W
R228	RN14BK2C5600F	RES. METAL FILM	560	1%	1/6W
R229	RD14BB2C163J	RES. CARBON	16K	5%	1/6W
R803	RD14BB2C100J	RES. CARBON	10	5%	1/6W
TC1	C05-0471-05	CAP. TRIMMER	30P		
TC2	C05-0460-05	CAP. TRIMMER	20P		
TC101	C05-0464-05	CAP. TRIMMER	2P		
TC102	NO USE				
TC103	C05-0464-05	CAP. TRIMMER	2P		
TH2	SDT100	THERMISTOR			
VR1	R12-0569-05	RES. SEMI FIXED	100 B		
VR2	NO USE				
VR3	R12-3453-05	RES. SEMI FIXED	10KB		
VR4	R12-0058-05	RES. SEMI FIXED	470 B		
VR101	R12-1538-05	RES. SEMI FIXED	1KB		
VR102	R12-0571-05	RES. SEMI FIXED	500 B		
VR103	R12-3453-05	RES. SEMI FIXED	10KB		
VR201	R12-3543-05	RES. SEMI FIXED	20KB		
VR202	R12-3543-05	RES. SEMI FIXED	20KB		

VOLUME UNIT

X81-2330-03

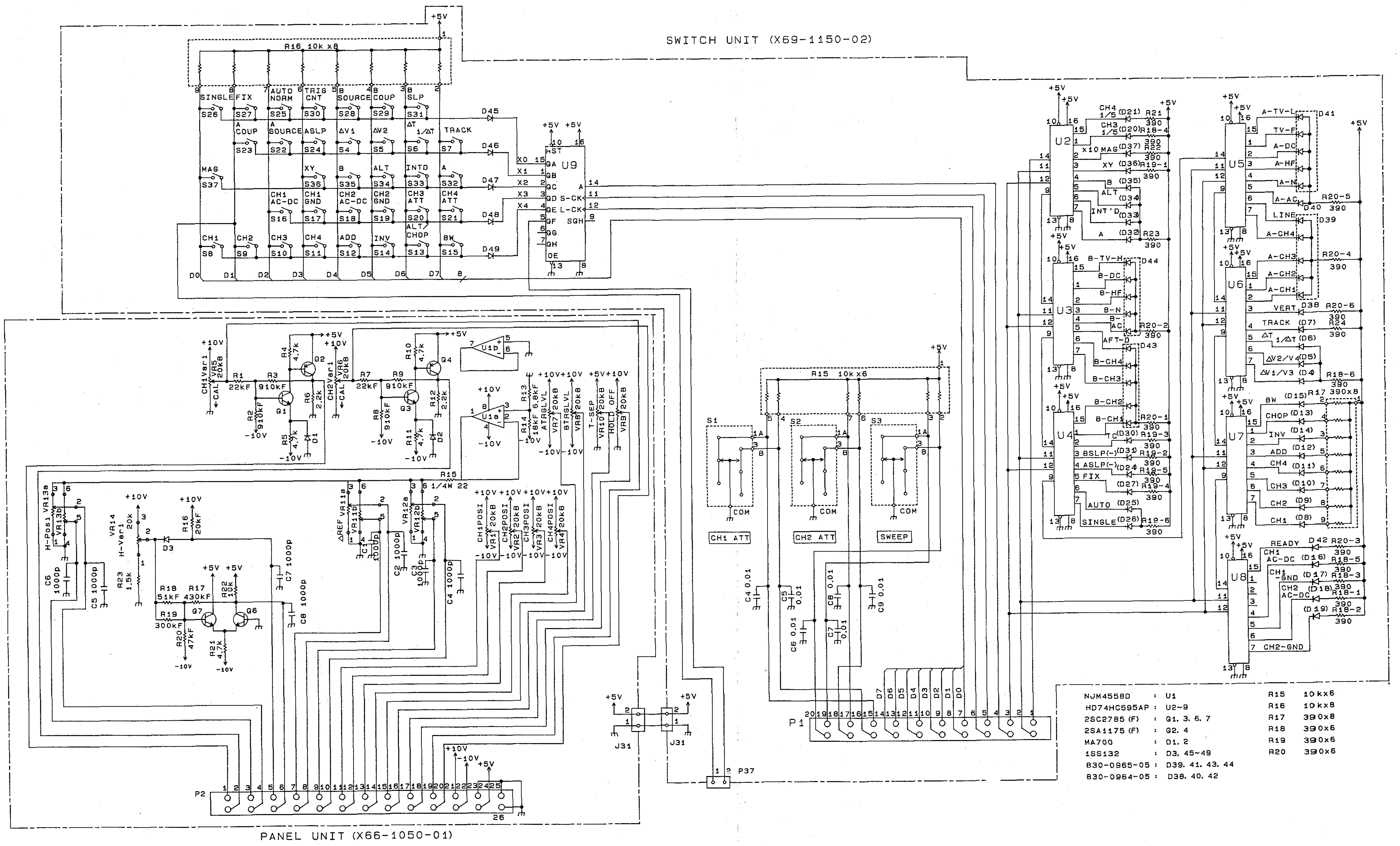
REF.NO	PARTS NO	NAME & DESCRIPTION			
	E01-0103-05	CRT SOCKET			
	E31-5585-05	WIRE ASS'Y(NO.23)			
	E38-0086-05	WIRE ASS'Y(NO.14)			
	E38-0087-05	WIRE ASS'Y(NO.15)			
	E38-0088-05	WIRE ASS'Y(NO.24)			
	F01-0859-14	HEAT SINK			
	J21-4610-04	BRACKET			
	J73-0011-13	PCB (UNMOUNTED)			
	N09-0623-04	SCREW, SEMS PAN HD			
	R92-0150-05	JUMPING RES.	ZERO OHM(10MM)		
C1	CC45CH2H0R5C	CAP. CERAMIC	0.5P	0.25P	500V
C2	CC45CH2H0R5C	CAP. CERAMIC	0.5P	0.25P	500V
C6	CE04EW1C101M	CAP. ELECTRO	100	20%	16V
C7	CK45F1H103Z	CAP. CERAMIC	0.01		50V
C8	CK45FB2H472K	CAP. CERAMIC	4700P	10%	500V
C9	CQ92M1H103J	CAP. MYLAR	0.01	5%	50V
C10	CE04EW1C470M	CAP. ELECTRO	47	20%	16V
C101	C91-0551-05	CAP. POLYESTER	0.22	10%	630V
C102	C91-0575-05	CAP. CERAMIC	1000P	20%	4KV
C103	C91-0575-05	CAP. CERAMIC	1000P	20%	4KV
D1	1SS132	DIODE			
D2	1SS132	DIODE			
D3	MTZ24JC	DIODE, ZENER	23.72V		
J21	E31-5571-05	LEAD WIRE WITH CONNECTOR			
L101	L33-0808-05	CHOKE COIL			
P20	E40-0328-05	PIN CONNECTOR	3P		
P21	E40-0328-05	PIN CONNECTOR	3P		
P25	E40-3301-05	PIN CONNECTOR	4P		
P26	E40-3307-05	PIN CONNECTOR	10P		
P27	E40-3237-05	PIN CONNECTOR	2P		
P28	E40-3299-05	PIN CONNECTOR	2P		
P29	E40-3299-05	PIN CONNECTOR	2P		
Q2	2SC1384(Q)	TR. SI, NPN			
Q3	2SA684(Q)	TR. SI, PNP			
Q4	2SA1175(F)	TR. SI, PNP			
Q5	2SC2785(F)	TR. SI, NPN			
Q6	2SD1666(S)	TR. SI, NPN			
R1	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R4	RD14BB2C221J	RES. CARBON	220	5%	1/6W
R5	RD14BB2C220J	RES. CARBON	22	5%	1/6W
R6	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R7	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R8	RD14BB2C103J	RES. CARBON	10K	5%	1/6W
R9	RD14BB2C104J	RES. CARBON	100K	5%	1/6W
R10	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R11	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R12	RD14BB2C333J	RES. CARBON	33K	5%	1/6W
R13	RD14BB2C433J	RES. CARBON	43K	5%	1/6W
R14	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R15	RD14BB2C162J	RES. CARBON	1.6K	5%	1/6W
R16	RD14BB2C182J	RES. CARBON	1.8K	5%	1/6W
R17	RD14BB2C271J	RES. CARBON	270	5%	1/6W
R18	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R19	RD14BB2C272J	RES. CARBON	2.7K	5%	1/6W
R20	RD14BB2C473J	RES. CARBON	47K	5%	1/6W
R21	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R22	RD14BB2C101J	RES. CARBON	100	5%	1/6W
R23	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R24	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R25	RD14BB2C100J	RES. CARBON	10	5%	1/6W
R26	RD14BB2C102J	RES. CARBON	1K	5%	1/6W
R101	RD14BY2H225J	RES. CARBON	2.2M	5%	1/2W
S101	S59-2505-05	SWITCH			
U1	NJM4558D	IC,DUAL OP AMP			
VR1	R05-3515-05	V.R. WITH SW(READOUT INT) 20KB			
VR2	R10-3505-05	V.R.(A/B INT,ROT+ILLUM)20KB X2			
VR3	R10-7501-05	V.R.(FOCUS/ASTIG)500KB/500KB			
VR4	R10-3505-05	V.R.(A/B INT,ROT+ILLUM)20KB X2			
VR5	R12-3543-05	RES. SEMI FIXED	20KB		
VR6	R12-1538-05	RES. SEMI FIXED	1KB		

SCHEMATIC DIAGRAM



CH1
CH2
CH3
CH4
ATT UNIT
X75-1180-01
JW5
JW6
P4
P5
P6
P7
P8
P9
CH1+ GND CH1-
CH2+ GND CH2-
CH3+ GND CH3- GND
CH4+ GND CH4- GND
+10V -10V GND
VERTICAL
PRE AMP UNIT
X73-1760-01
P10
P11
P30
CH1OUT
GND
CH1OUT
50mV/div
Y+ GND Y-
Delay
LINE
FINAL UNIT
X80-1100-03
DFX- DFX+ DFY+ DFY-
P12
P13
P14
P15
150XTM31
ANODE
R/O UNIT
X77-1490-01
A ROR
B ROA
C ROOFF
P3
P2
P1
S.DATA (ATT) S.CK (ATT) L.CK (ATT) CH4PB CH3PB CH2PB CH1PB +5V GND
CONNECTION UNIT
X77-1500-01
-10V +5V GND ROY SGL DTP AVAR VD VLC L-CK ROUBL ROBLK INTE ROREQ RST 2POS 4POS BLVL HO 2VAR
+10V +5V GND ROX GND HPOSI BVAR VSC SD S-CK ROOFF GND SGA XY RDY 1POS 3POS ALVL T-SEP 1VAR
40
20
P18
P17
P19
P34
HIGH VOLTAGE UNIT
X68-1510-03
P23
P24
P25
P26
GND UNBL ROOFF ROINT AINT BINT ILLUM +10V -10V +13V -13V +140V
P2 G2 FCS +140V
VR UNIT
X81-2330-03
A/4
ROT GND
P27
P28
P29
CAL
LMP
-13V
Z AXIS
R1 470
C1 33p 500V
PANEL UNIT
X66-1050-01
SWITCH UNIT
X69-1150-02
P37
HORIZONTAL UNIT
X74-1480-03
25
26
LINE COUNTER
UNIT
X76-1400-00
P35
AUTO/NORM
TV.CLOCK
DATA
TV.LOAD
TC.LOAD
TV H
TV.TRIG
P36
P38
FOOT.SW
POWER SUPPLY UNIT
X68-1500-01
GND 5V 5V 10V 10V 60V 60V 140V 140V
X81-2330-03 B/4
X81-2330-03 C/4
240V
220V
120V
100V
P20
P21

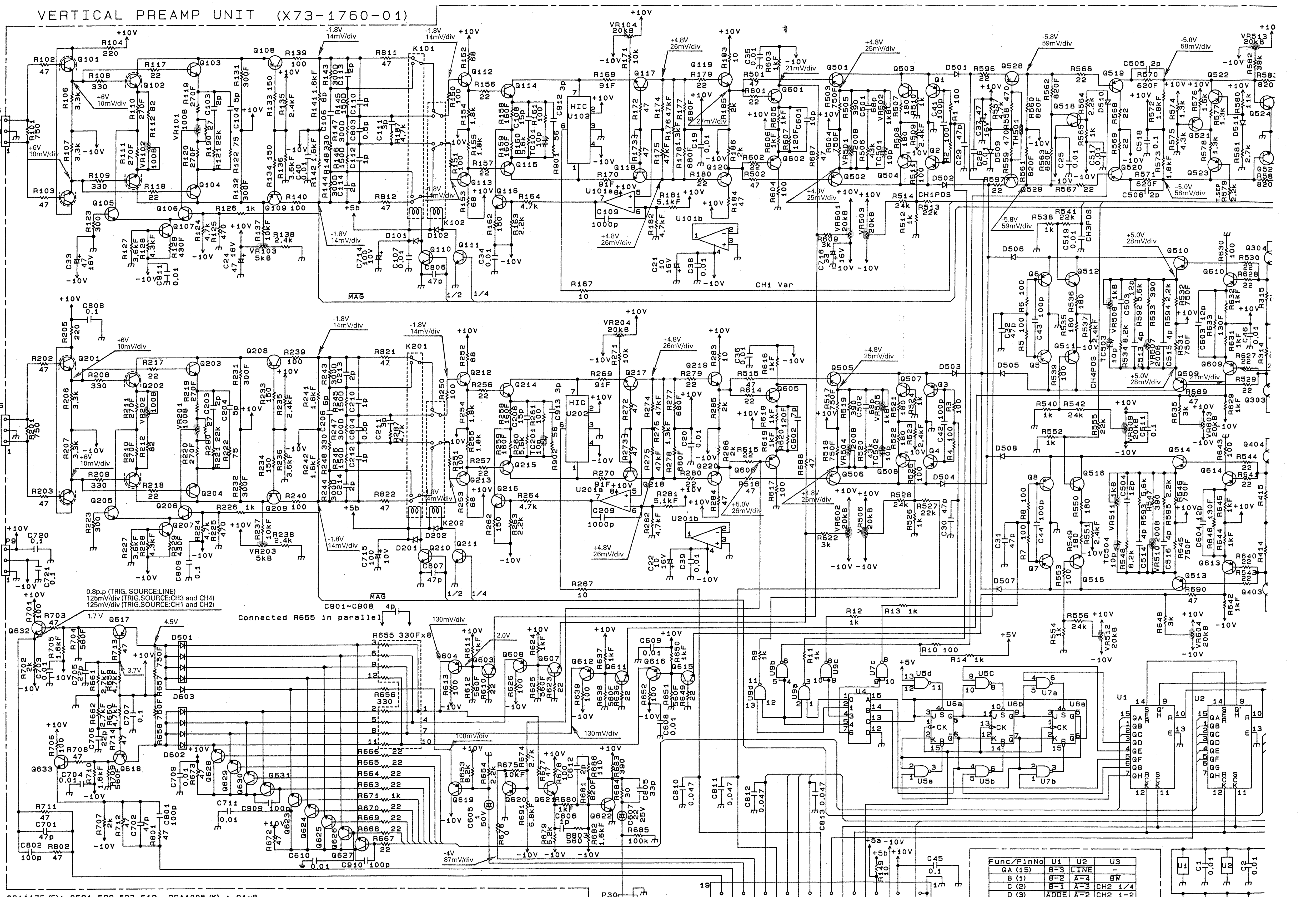
SCHEMATIC DIAGRAM


SWITCH UNIT (X69-1150-02)
PANEL UNIT (X66-1050-01)
R16 10k x8
R15 10k x6
U9
U2
U3
U4
U5
U6
U7
U8
U1a
U1b
S1
S2
S3
CH1 ATT
CH2 ATT
SWEEP
COM
P1
P2
J31
P37
+5V
+10V
-10V

NJM4558D : U1
HD74HC595AP : U2~9
2SC2785 (F) : Q1, 3, 6, 7
2SA1175 (F) : Q2, 4
MA700 : D1, 2
1SS132 : D3, 45~49
B30-0965-05 : D39, 41, 43, 44
B30-0964-05 : D38, 40, 42

R15 10kx6
R16 10kx8
R17 390x8
R18 390x6
R19 390x6
R20 390x6

VERTICAL PREAMP UNIT (X73-1760-01)


P5
CH1
P6
CH2
ATT.P
P9
HIC
U102
U202
CH1 Var
CH1POS
CH3POS
CH4POS
MAG
1/2
1/4
0.8p.p (TRIG. SOURCE:LINE)
125mV/div (TRIG.SOURCE:CH3 and CH4)
125mV/div (TRIG.SOURCE:CH1 and CH2)
C901~C908 4p
Connected R655 in parallel
R655 330F×8
R656 330
P30
CH1 OUT
P10
BTrig⊕
ATrig⊕
LINE.T
X⊖
CH2Pos
CH1Pos
CH4Pos
CH3Pos
CH2Var
CH1Var
S.CLK
S.DATA
CLK
L.CLK
-10V
+5V
T.SEP
+10V
U1
U2
U4
U5
U6
C1 0.01
C2 0.01
C5 0.01
C6 0.01

Func/PinNo	U1	U2	U3
QA (15)	B-3	LINE	-
B (1)	B-2	$\overline{\text{A-4}}$	$\overline{\text{BW}}$
C (2)	B-1	$\overline{\text{A-3}}$	CH2 1/4
D (3)	$\overline{\text{ADDE}}$	$\overline{\text{A-2}}$	CH2 1-2
E (4)	$\overline{\text{CH4E}}$	$\overline{\text{A-1}}$	$\overline{\text{CH2 MAG}}$
F (5)	$\overline{\text{CE3E}}$	B-4	CH1 1/4
G (6)	$\overline{\text{CH2E}}$	-	CH1 1/2
H (7)	$\overline{\text{CH1E}}$	-	$\overline{\text{CH1 MAG}}$

2SA1175 (F) : Q521, 522, 523, 619, Q620

2SA1206 : Q501, 502, 505, 506, Q509, 510, 513, 514, Q519, 520, 526, 527, Q601, 602, 604, 605, Q606, 608, 609, 610, Q612, 613, 614, 616

2SA1005 (K) : Q1~8

2SA1161 : Q108, 109, 208, 209, Q528, 529, 617, 618

2SC3315 (C) : Q105, 106, 107, 205, Q206, 207, 503, 504, Q507, 508, 511, 512, Q515, 516, 624, 625, Q626, 627, 628, 629, Q630, 631

2SC2785 (F) : Q116, 216, 623

2SC3732 (L) : Q518

2SC3779 (D) : Q103, 104, 112~115, Q117~120, 203, 204, Q212~215, 217~220, Q301~304, 401~404, Q524, 525, 603, 607, Q611, 615, 621, 622, Q632, 633

2SC4049 : Q110, 111, 210, 211

2SC4072 : Q101, 102, 201, 202

SN74ALS00AN : U5, 7, 9

SN74ALS112AN : U6, 8

HD74LS42P : U4

HD74HC595P : U1, 2, 3

NJM4558D : U101, 201

KMC03 : U102, U202

1SS132 : D101, 102, 201, 202 D501~508, 509, 511, D603

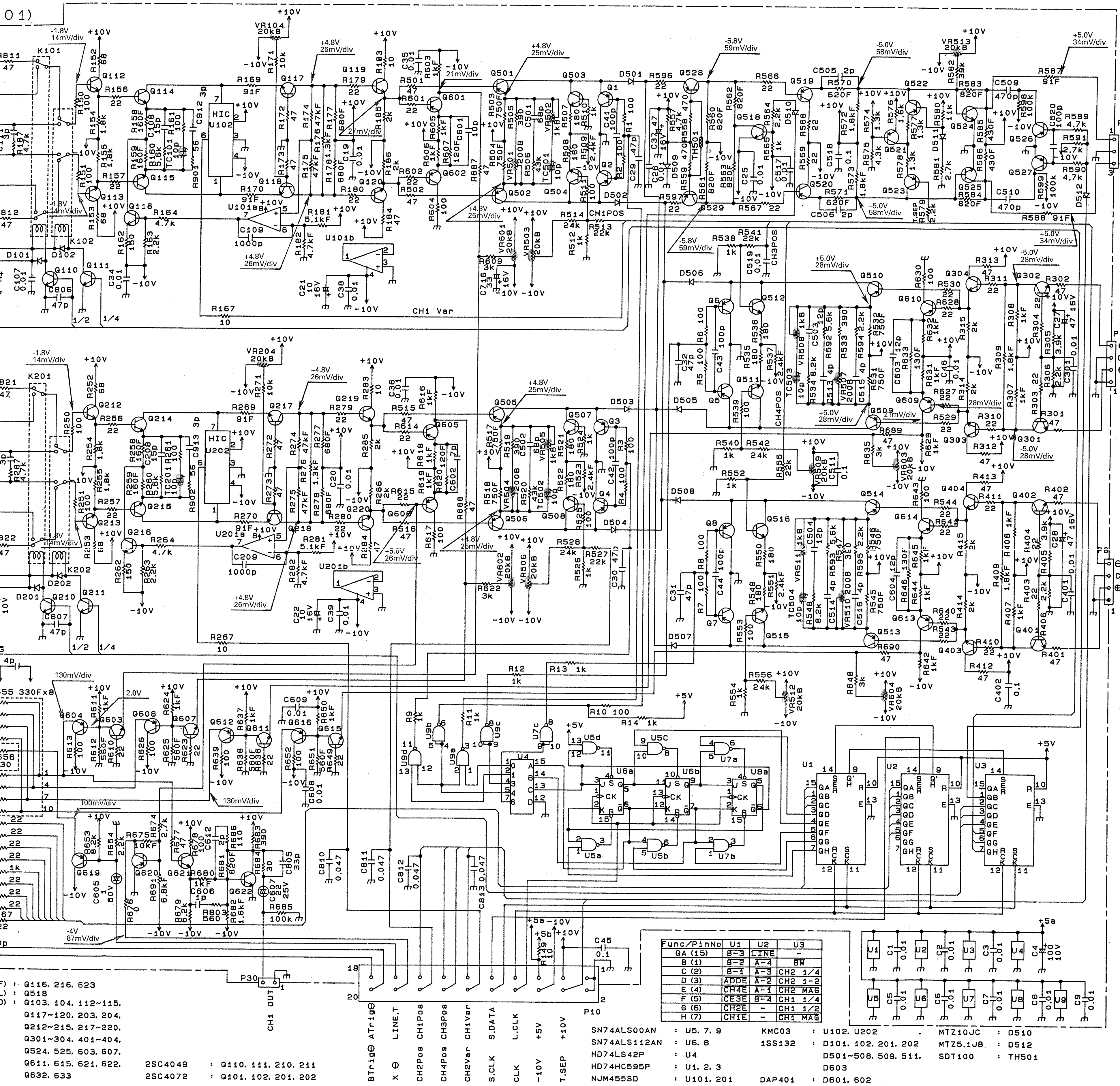
DAP401 : D601, 602

MTZ1

MTZ5

SDT1

SCHEMATIC DIAGRAM


CH1 Var
V.OUT
P11
P7
CH3
P8
CH4
P10
P30
CH1 OUT
BTrig⊕ ATrig⊖
X ⊖
LINE.T
CH1Pos
CH2Pos
CH3Pos
CH4Pos
CH1Var
CH2Var
S.DATA
S.CLK
L.CLK
CLK
+5V
-10V
+10V
T.SEP
CH1POS
CH3POS
CH4POS
U1
U2
U3
U4
HIC U102
HIC U202

Func/PinNo	U1	U2	U3
QA (15)	$\overline{B-3}$	LINE	-
B (1)	$\overline{B-2}$	$\overline{A-4}$	$\overline{BW}$
C (2)	$\overline{B-1}$	$\overline{A-3}$	CH2 1/4
D (3)	$\overline{ADDE}$	$\overline{A-2}$	CH2 1-2
E (4)	$\overline{CH4E}$	$\overline{A-1}$	$\overline{CH2\ MAG}$
F (5)	$\overline{CE3E}$	$\overline{B-4}$	CH1 1/4
G (6)	$\overline{CH2E}$	-	CH1 1/2
H (7)	$\overline{CH1E}$	-	$\overline{CH1\ MAG}$

F) : Q116, 216, 623
L) : Q518
D) : Q103, 104, 112~115,
Q117~120, 203, 204,
Q212~215, 217~220,
Q301~304, 401~404,
Q524, 525, 603, 607,
Q611, 615, 621, 622,
Q632, 633

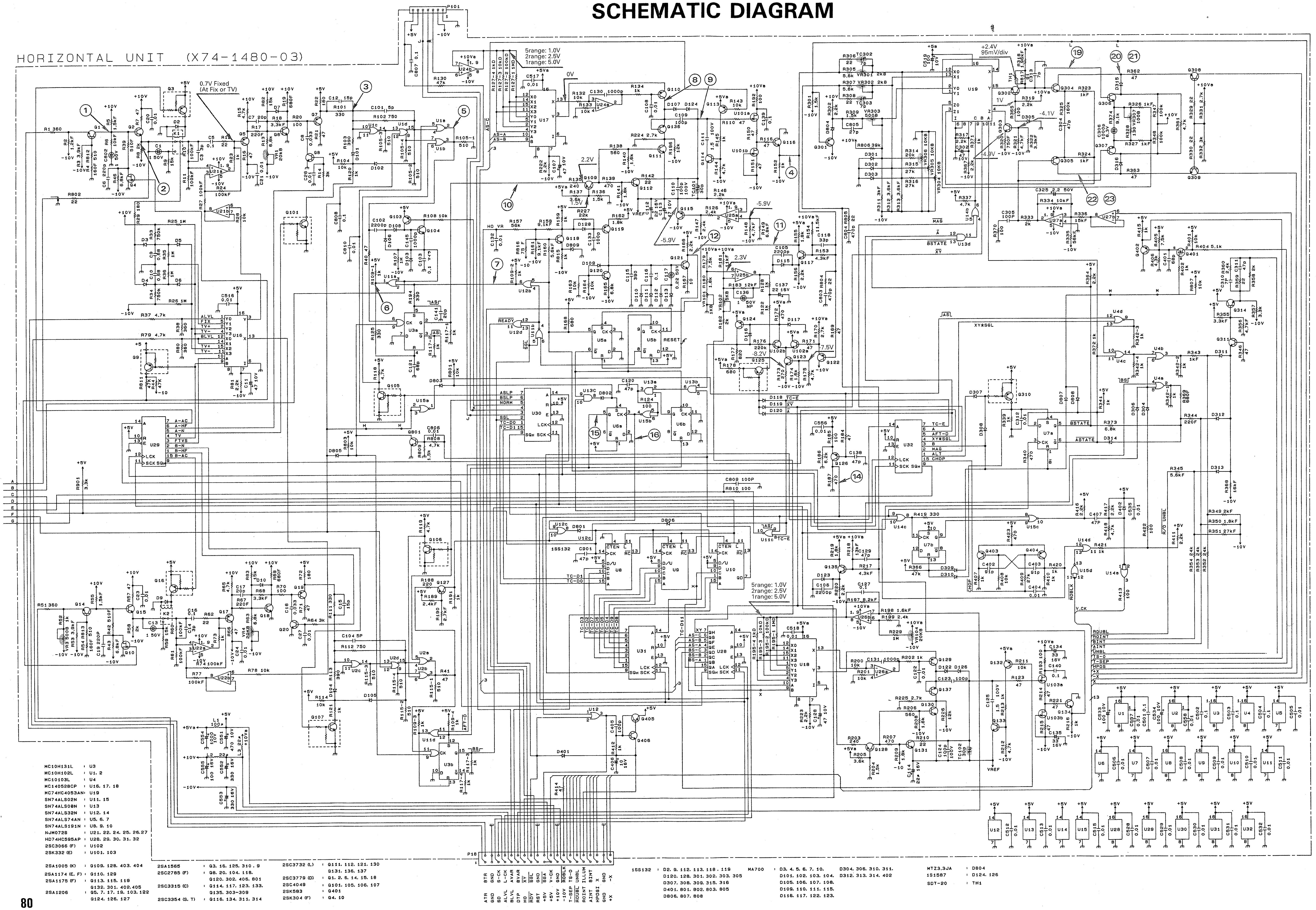
2SC4049 : Q110, 111, 210, 211
2SC4072 : Q101, 102, 201, 202

SN74ALS00AN : U5, 7, 9
SN74ALS112AN : U6, 8
HD74LS42P : U4
HD74HC595P : U1, 2, 3
NJM4558D : U101, 201

KMC03 : U102, U202
1SS132 : D101, 102, 201, 202
D501~508, 509, 511,
D603
DAP401 : D601, 602

MTZ10JC : D510
MTZ5.1JB : D512
SDT100 : TH501

SCHEMATIC DIAGRAM


HORIZONTAL UNIT (X74-1480-03)
P101
P18
0.7V Fixed (At Fix or TV)
5range: 1.0V
2range: 2.5V
1range: 5.0V
+2.4V
95mV/div
BSTATE
ASTATE
XY
MAG
ASL
XY×SGL
BTR GND S-CK L-CK AVAR BVAR XY SGL GND RST SGL ASL V-CK GND +5V -10V +10V T-SEP UNBL ROUBL ILLUM SINT HPOSI X GND -X
ATR GND SD ALVL BLVL DTP HO RDY SGL +5V +5V -10V +10V T-SEP TS-O UNBL ROINT AINT HPDSI GND +X

MC10H131L : U3
MC10H102L : U1. 2
MC10103L : U4
MC14052BCP : U16. 17. 18
MC74HC4053AN: U19
SN74ALS02N : U11. 15
SN74ALS08N : U13
SN74ALS32N : U12. 14
SN74ALS74AN : U5. 6. 7
SN74ALS191N : U8. 9. 10
NJM072S : U21. 22. 24. 25. 26.27
HD74HC595AP : U28. 29. 30. 31. 32
2SC3066 (F) : U102
2SK332 (E) : U101. 103

2SA1005 (K) : Q109. 128. 403. 404
2SA1174 (E. F) : Q110. 129
2SA1175 (F) : Q113. 115. 119
Q132. 301. 402.405
2SA1206 : Q5. 7. 17. 19. 103. 122
Q124. 126. 127

2SA1565 : Q3. 16. 125. 310 . 9
2SC2785 (F) : Q8. 20. 104. 118.
Q120. 302. 406. 801
2SC3315 (C) : Q114. 117. 123. 133.
Q135. 303~309
2SC3354 (S. T) : Q116. 134. 311. 314

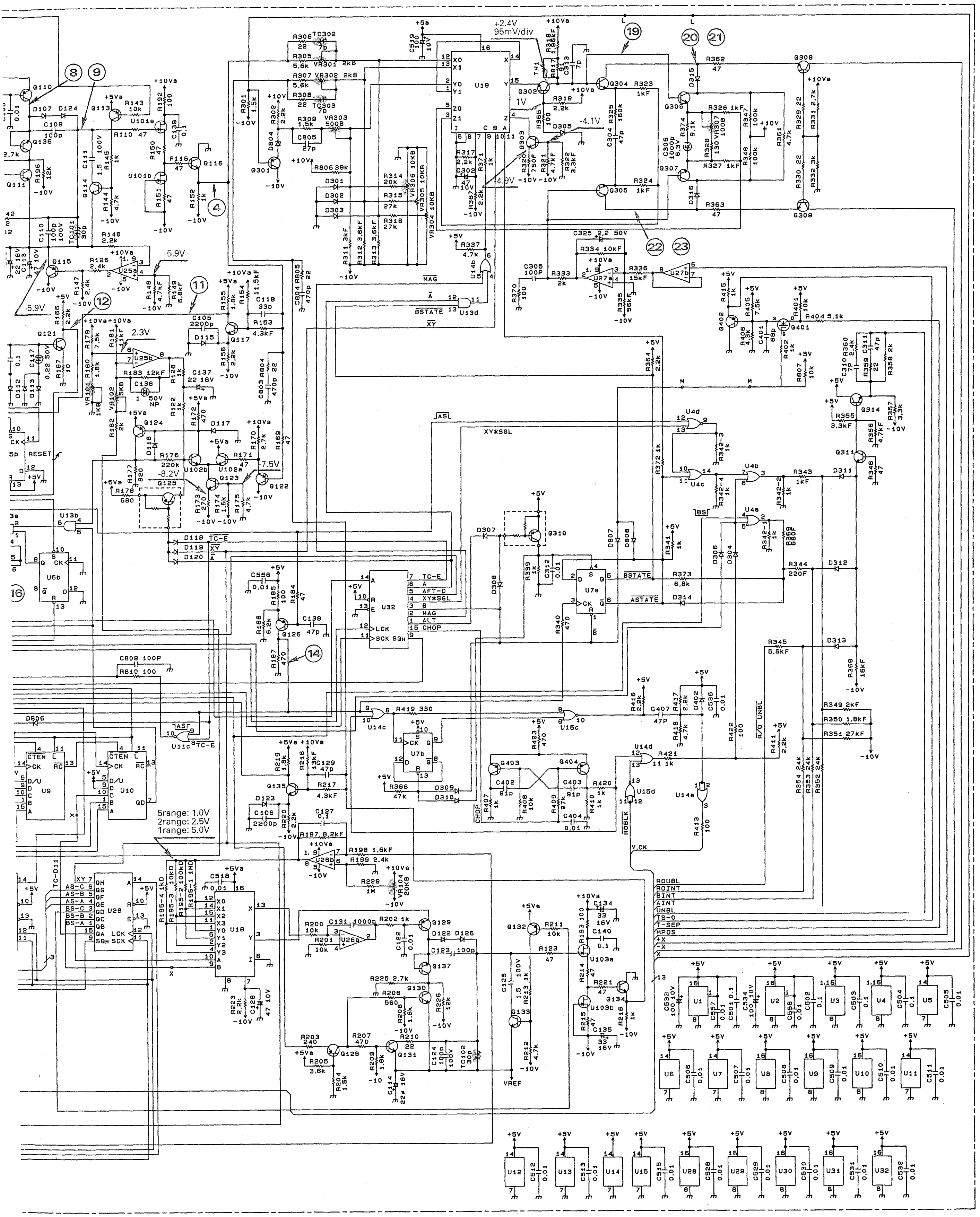
2SC3732 (L) : Q111. 112. 121. 130
Q131. 136. 137
2SC3779 (D) : Q1. 2. 6. 14. 15. 18
2SC4049 : Q101. 105. 106. 107
2SK583 : Q401
2SK304 (F) : Q4. 10

1SS132 : D2. 9. 112. 113. 118 . 119
D120. 128. 301. 302. 303. 305
D307. 308. 309. 315. 316
D401. 801. 802. 803. 805
D806. 807. 808

MA700 : D3. 4. 5. 6. 7. 10.
D101. 102. 103. 104.
D105. 106. 107. 108.
D109. 110. 111. 115.
D116. 117. 122. 123.
D304. 306. 310. 311.
D312. 313. 314. 402

MTZ3.3JA : D804
1S1587 : D124. 126
SDT-20 : TH1

EMATIC DIAGRAM



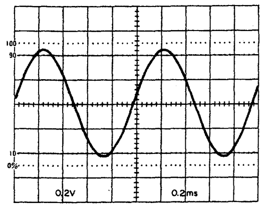
: D2. 9. 112. 113. 118. 119
D120. 128. 301. 302. 303. 305
D307. 308. 309. 315. 316
D401. 801. 802. 803. 805
D806. 807. 808

MA700 : D3. 4. 5. 6. 7. 10.
D101. 102. 103. 104.
D105. 106. 107. 108.
D109. 110. 111. 115.
D116. 117. 122. 123.
D304. 306. 310. 311.
D312. 313. 314. 402

MTZ3.3JA : D804
1S1587 : D124. 126
SDT-20 : TH1

SCHEMATIC DIAGRAM

①



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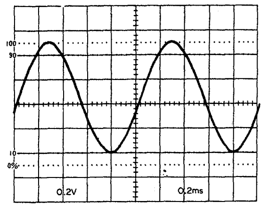

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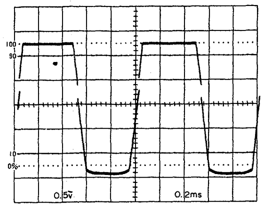

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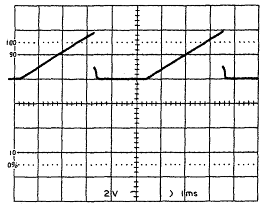

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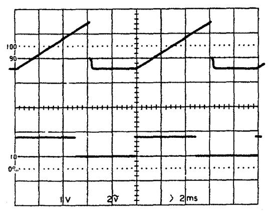

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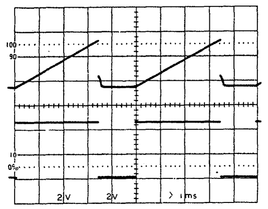

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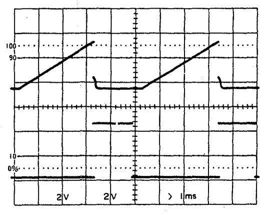

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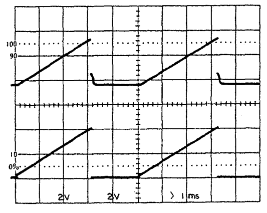

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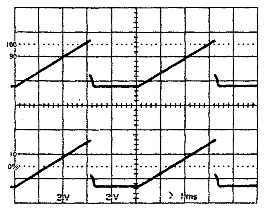

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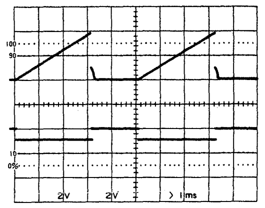

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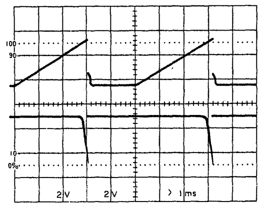

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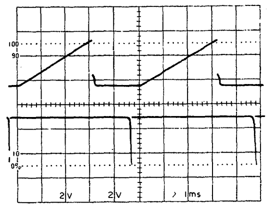

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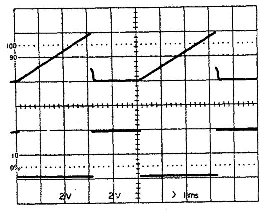

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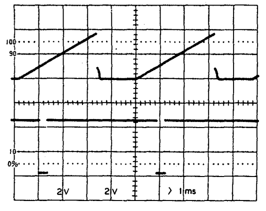

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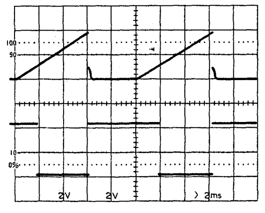

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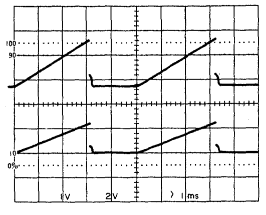

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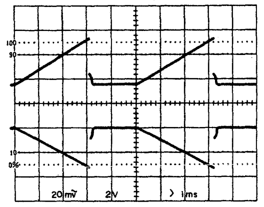

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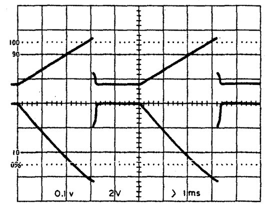

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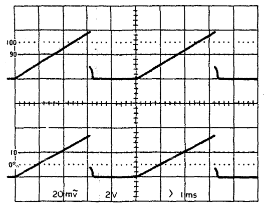

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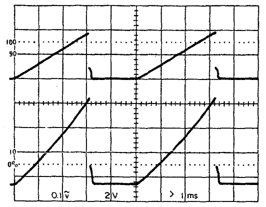
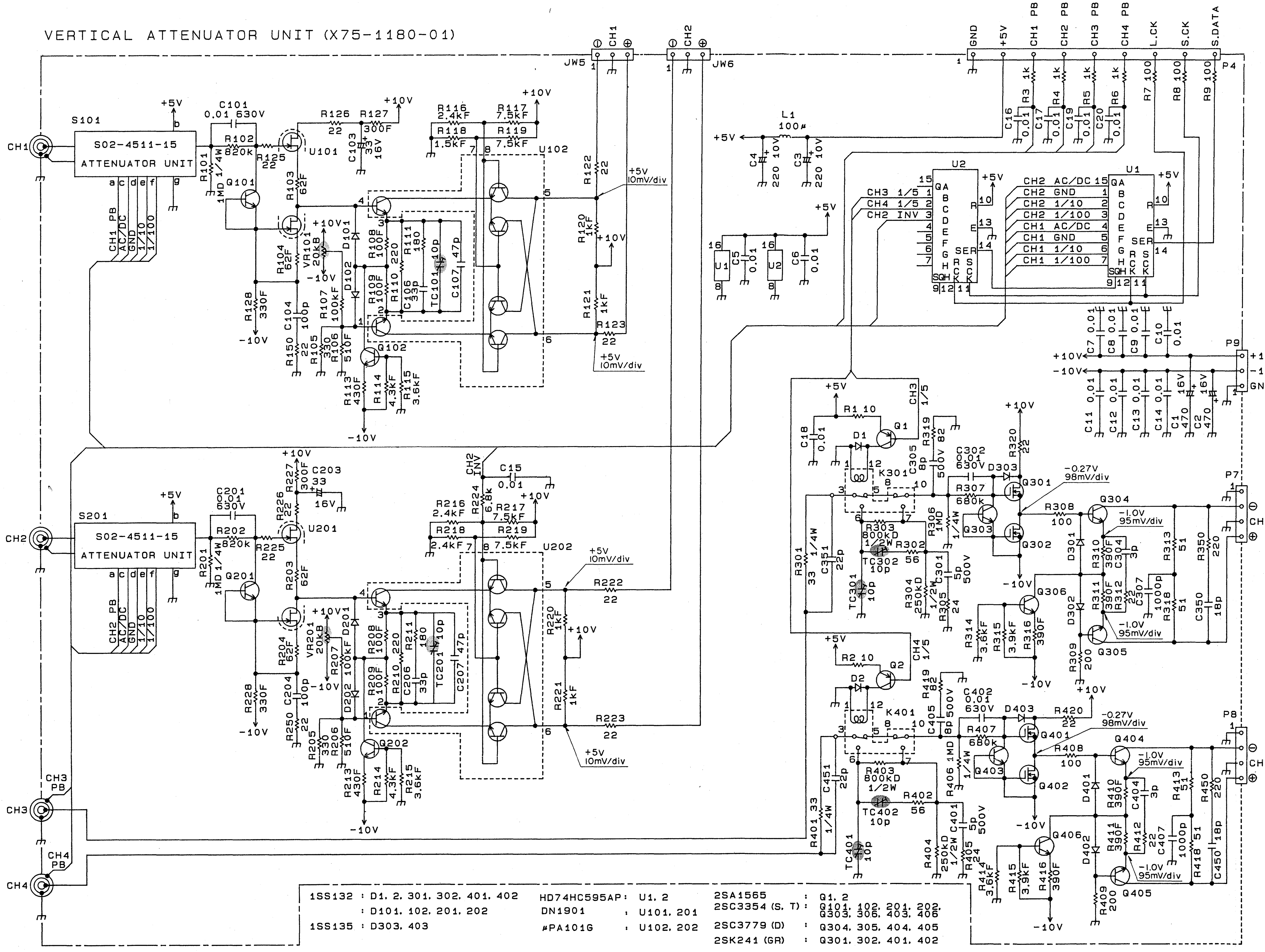


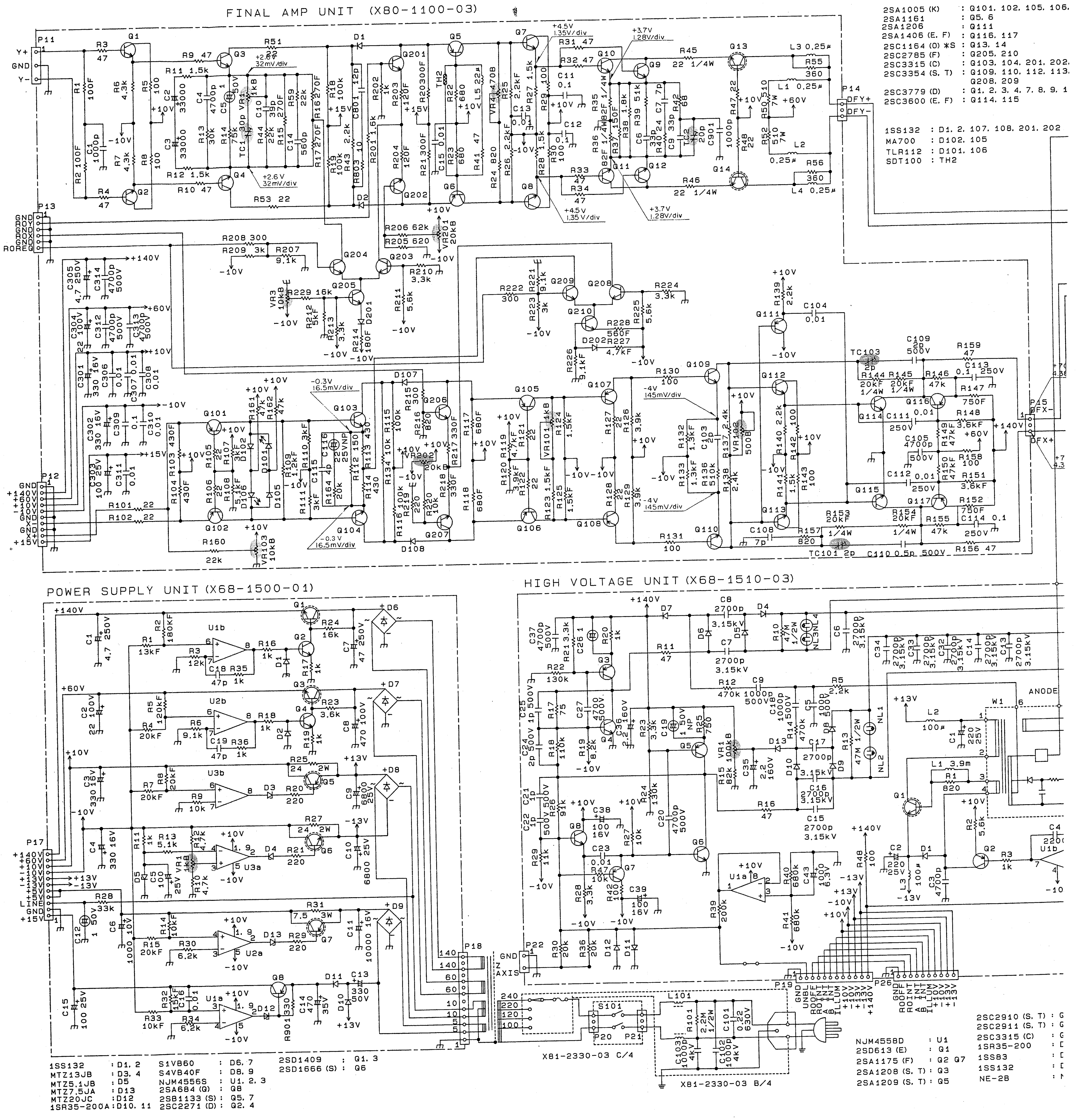
SCHEMATIC DIAGRAM


VERTICAL ATTENUATOR UNIT (X75-1180-01)
CH1
CH2
CH3
CH4
CH3 PB
CH4 PB
S101
S201
S02-4511-15 ATTENUATOR UNIT
CH1 PB
CH2 PB
AC/DC
GND
1/10
1/100
JW5
JW6
P4
P7
P8
P9
GND
+5V
CH1 PB
CH2 PB
CH3 PB
CH4 PB
L.CK
S.CK
S.DATA
U1
U2
U101
U102
U201
U202
Q101
Q102
Q201
Q202
K301
K401
Q1
Q2
Q301
Q302
Q303
Q304
Q305
Q306
Q401
Q402
Q403
Q404
Q405
Q406
L1 100μ
+10V
-10V
+5V 10mV/div
-0.27V 98mV/div
-1.0V 95mV/div
CH2 INV
CH3 1/5
CH4 1/5

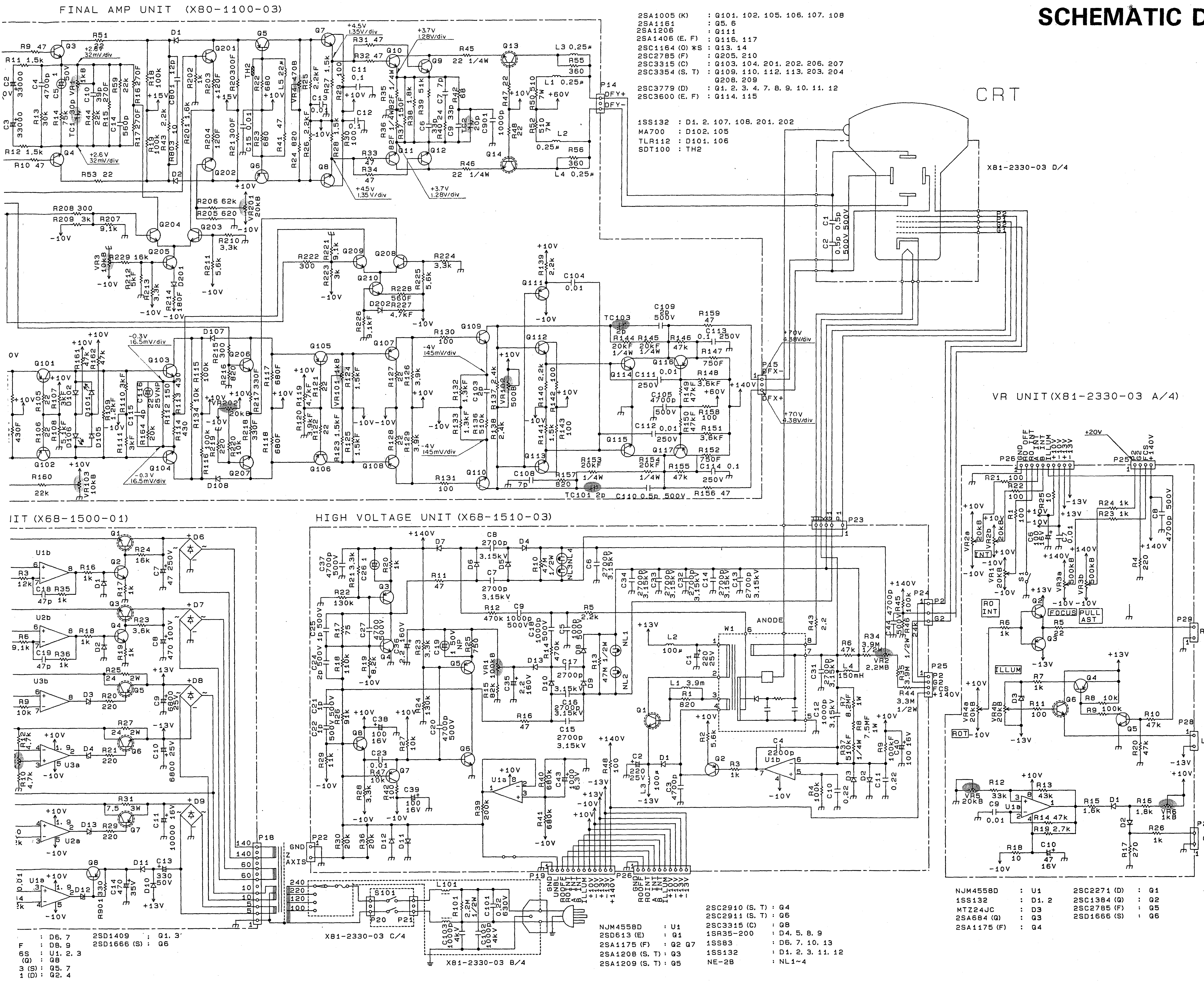
1SS132 : D1, 2, 301, 302, 401, 402
: D101, 102, 201, 202
1SS135 : D303, 403
HD74HC595AP : U1, 2
DN1901 : U101, 201
μPA101G : U102, 202
2SA1565 : Q1, 2
2SC3354 (S, T) : Q101, 102, 201, 202, Q303, 306, 403, 406
2SC3779 (D) : Q304, 305, 404, 405
2SK241 (GR) : Q301, 302, 401, 402

FUNC/PinNo	U1	U2
E (4)	CH1 AC/DC	-
F (5)	CH1 GND	-
G (6)	CH1 1/10	-
H (7)	CH1 1/100	-

FUNC/PinNo	U1	U2
QA (15)	CH2 AC/DC	-
B (1)	CH2 GND	CH3 1/5
C (2)	CH2 1/10	CH4 1/5
D (3)	CH2 1/100	CH2 INV

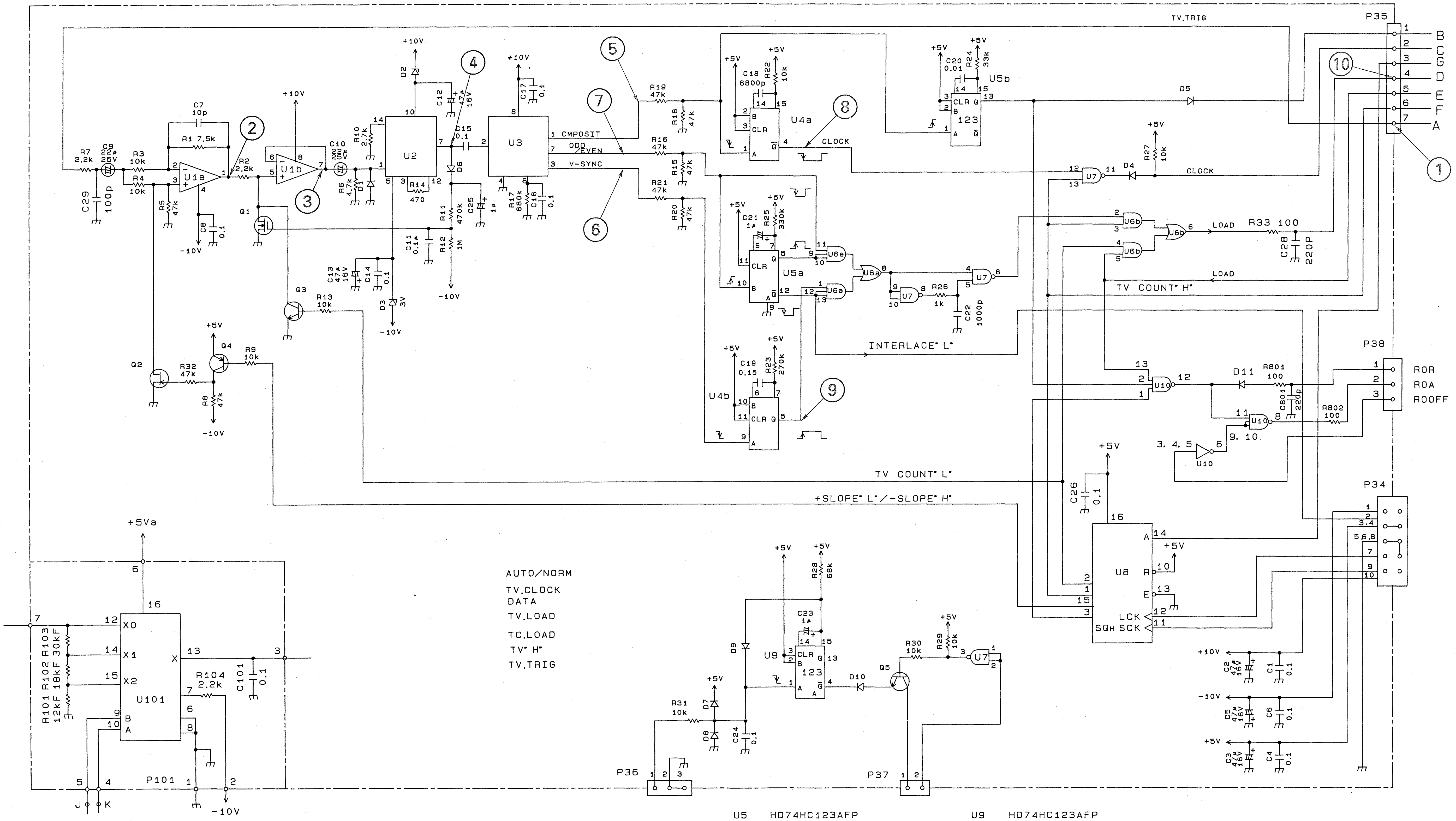

FINAL AMP UNIT (X80-1100-03)
POWER SUPPLY UNIT (X68-1500-01)
HIGH VOLTAGE UNIT (X68-1510-03)
2SA1005 (K) : Q101. 102. 105. 106.
2SA1161 : Q5. 6
2SA1206 : Q111
2SA1406 (E. F) : Q116. 117
2SC1164 (O) *S : Q13. 14
2SC2785 (F) : Q205. 210
2SC3315 (C) : Q103. 104. 201. 202.
2SC3354 (S. T) : Q109. 110. 112. 113.
Q208. 209
2SC3779 (D) : Q1. 2. 3. 4. 7. 8. 9. 1
2SC3600 (E. F) : Q114. 115
1SS132 : D1. 2. 107. 108. 201. 202
MA700 : D102. 105
TLR112 : D101. 106
SDT100 : TH2
1SS132 : D1. 2
MTZ13JB : D3. 4
MTZ5.1JB : D5
MTZ7.5JA : D13
MTZ20JC : D12
1SR35-200A : D10. 11
S1VB60 : D6. 7
S4VB40F : D8. 9
NJM4556S : U1. 2. 3
2SA684 (Q) : Q8
2SB1133 (S) : Q5. 7
2SC2271 (D) : Q2. 4
2SD1409 : Q1. 3
2SD1666 (S) : Q6
X81-2330-03 C/4
X81-2330-03 B/4
NJM4558D : U1
2SD613 (E) : Q1
2SA1175 (F) : Q2 Q7
2SA1208 (S. T) : Q3
2SA1209 (S. T) : Q5
2SC2910 (S. T) : G
2SC2911 (S. T) : G
2SC3315 (C) : G
1SR35-200 : [
1SS83 : [
1SS132 : [
NE-2B : N
ANODE
DFY+
DFY-
DFX-
DFX+

SCHEMATIC DIAGRAM


FINAL AMP UNIT (X80-1100-03)
CRT
X81-2330-03 D/4
VR UNIT(X81-2330-03 A/4)
HIGH VOLTAGE UNIT (X68-1510-03)
IT (X68-1500-01)
X81-2330-03 C/4
X81-2330-03 B/4
DFY+
DFY-
DFX-
DFX+
ANODE
ROT
LMP
CAL
FOCUS
PULL AST
ILLUM
INT
RO INT
GND
Z AXIS
2SA1005 (K) : Q101, 102, 105, 106, 107, 108
2SA1161 : Q5, 6
2SA1206 : Q111
2SA1406 (E, F) : Q116, 117
2SC1164 (O) *S : Q13, 14
2SC2785 (F) : Q205, 210
2SC3315 (C) : Q103, 104, 201, 202, 206, 207
2SC3354 (S, T) : Q109, 110, 112, 113, 203, 204
Q208, 209
2SC3779 (D) : Q1, 2, 3, 4, 7, 8, 9, 10, 11, 12
2SC3600 (E, F) : Q114, 115
1SS132 : D1, 2, 107, 108, 201, 202
MA700 : D102, 105
TLR112 : D101, 106
SDT100 : TH2
NJM4558D : U1
2SD613 (E) : Q1
2SA1175 (F) : Q2 Q7
2SA1208 (S, T) : Q3
2SA1209 (S, T) : Q5
2SC2910 (S, T) : Q4
2SC2911 (S, T) : Q6
2SC3315 (C) : Q8
1SR35-200 : D4, 5, 8, 9
1SS83 : D6, 7, 10, 13
1SS132 : D1, 2, 3, 11, 12
NE-2B : NL1~4
NJM4558D : U1
1SS132 : D1, 2
MTZ24JC : D3
2SA684 (Q) : Q3
2SA1175 (F) : Q4
2SC2271 (D) : Q1
2SC1384 (Q) : Q2
2SC2785 (F) : Q5
2SD1666 (S) : Q6
: D6, 7
F : D8, 9
6S : U1, 2, 3
(Q) : Q8
3 (S) : Q5, 7
1 (D) : Q2, 4
2SD1409 : Q1, 3
2SD1666 (S) : Q6

SCHEMATIC DIAGRAM

LINE COUNTER UNIT (X76-1400-00)



TV.TRIG
P35
B
C
G
D
E
F
A
①
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
U1a
U1b
U2
U3
U4a
U4b
U5a
U5b
U6a
U6b
U6b
U7
U8
U9
U10
U101
Q1
Q2
Q3
Q4
Q5
CMPOSIT
ODD/EVEN
V-SYNC
CLOCK
LOAD
R33 100
TV COUNT" H"
INTERLACE" L"
TV COUNT" L"
+SLOPE" L"/-SLOPE" H"
P38
ROR
ROA
ROOFF
P34
P36
P37
P101
+5Va
-10V
+10V
+5V
AUTO/NORM
TV.CLOCK
DATA
TV.LOAD
TC.LOAD
TV" H"
TV.TRIG
R101 R102 R103
12kF 18kF 30kF
R104 2.2k
C101 0.1
J
K

2SC2785 (F) : Q3, 5
2SA1175 (F) : Q4
2SK241 (GR) : Q1
2SK304 (F) : Q2

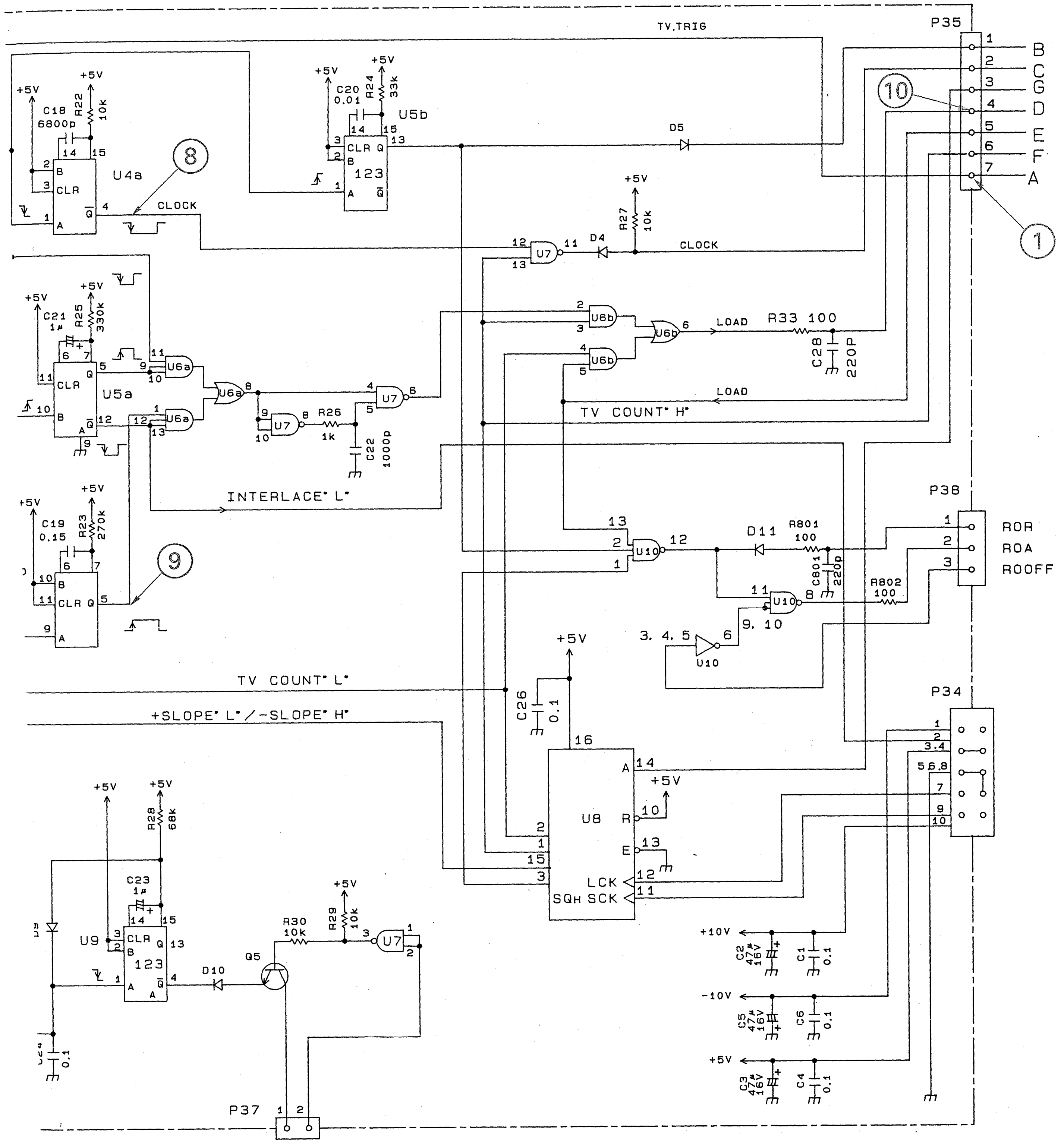
1SS132 : D4 5 6 7 8 9 11
MA700 : D1, 10
MTZ3.0JA : D2, 3

U1 NJM072M
U2 UA733CNS
U3 LM1881M
U4 HD74HC221FP

U5 HD74HC123AFP
U6 HD74HC58F
U7 HD74HC00FP
U8 HD74HC595FP

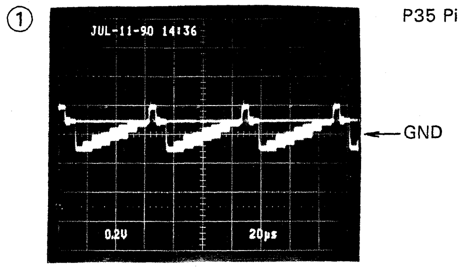
U9 HD74HC123AFP
U10 HD74HC10FP
U101 HD14052BFP

DIAGRAM

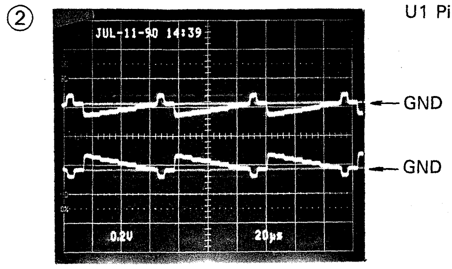

TV.TRIG
P35
1 B
2 C
3 G
4 D
5 E
6 F
7 A
⑩
①
⑧
⑨
+5V
C18 6800p
R22 10k
U4a
CLR
CLOCK
C20 0.01
R24 33k
U5b
123
D5
+5V
R27 10k
D4
CLOCK
U7
U6b
LOAD
R33 100
C28 220P
LOAD
TV COUNT" H"
C21 1μ
R25 330k
U5a
U6a
U7
R26 1k
C22 1000p
INTERLACE" L"
C19 0.15
R23 270k
P38
1 ROR
2 ROA
3 ROOFF
U10
D11
R801 100
C801 220p
R802 100
3. 4. 5
U10
9. 10
+5V
TV COUNT" L"
+SLOPE" L"/-SLOPE" H"
C26 0.1
P34
U8
A 14
R
E
LCK
SQH SCK
+5V
+10V
-10V
+5V
C2 47μ 16V
C1 0.1
C5 47μ 16V
C6 0.1
C3 47μ 16V
C4 0.1
R28 68k
C23 1μ
U9
CLR
123
D10
Q5
R30 10k
R29 10k
U7
P37

J5 HD74HC123AFP
J6 HD74HC58F
I7 HD74HC00FP
J8 HD74HC595FP

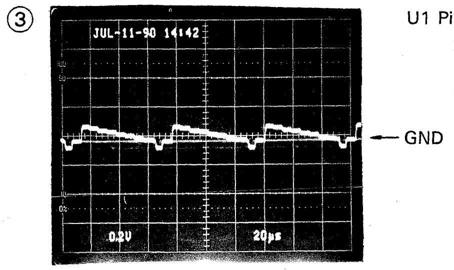
U9 HD74HC123AFP
U10 HD74HC10FP
U101 HD14052BFP



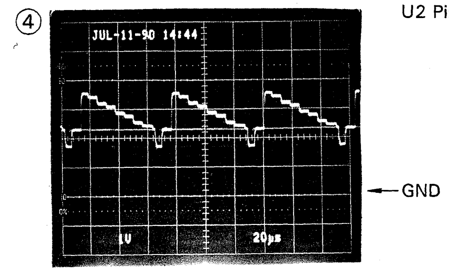
P35 Pin 7



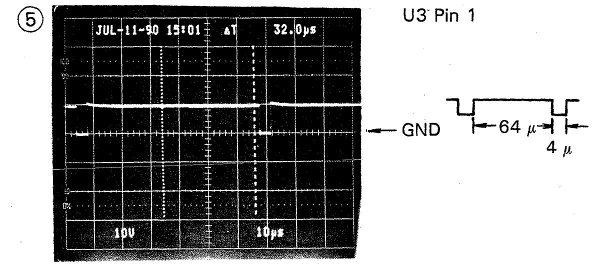
U1 Pin1



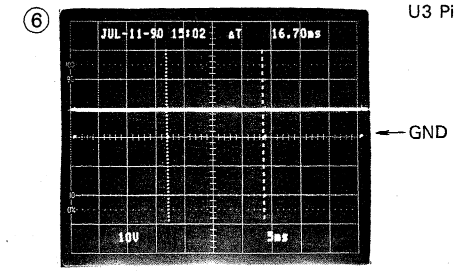
U1 Pin 7



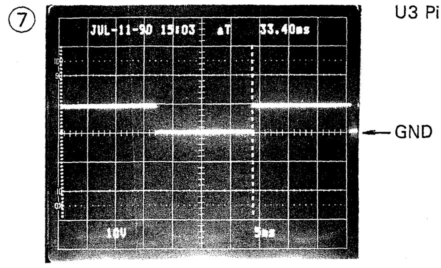
U2 Pin 7



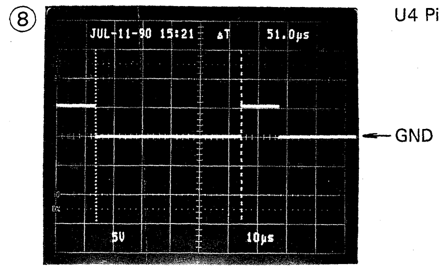
U3 Pin 1



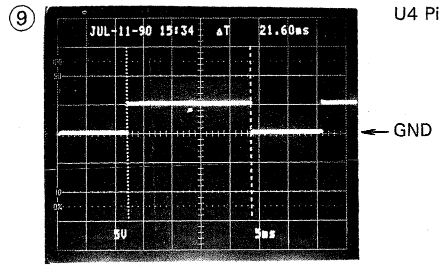
U3 Pin3



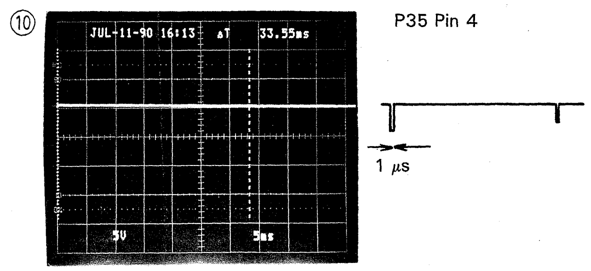
U3 Pin 7



U4 Pin 4



U4 Pin 5



P35 Pin 4

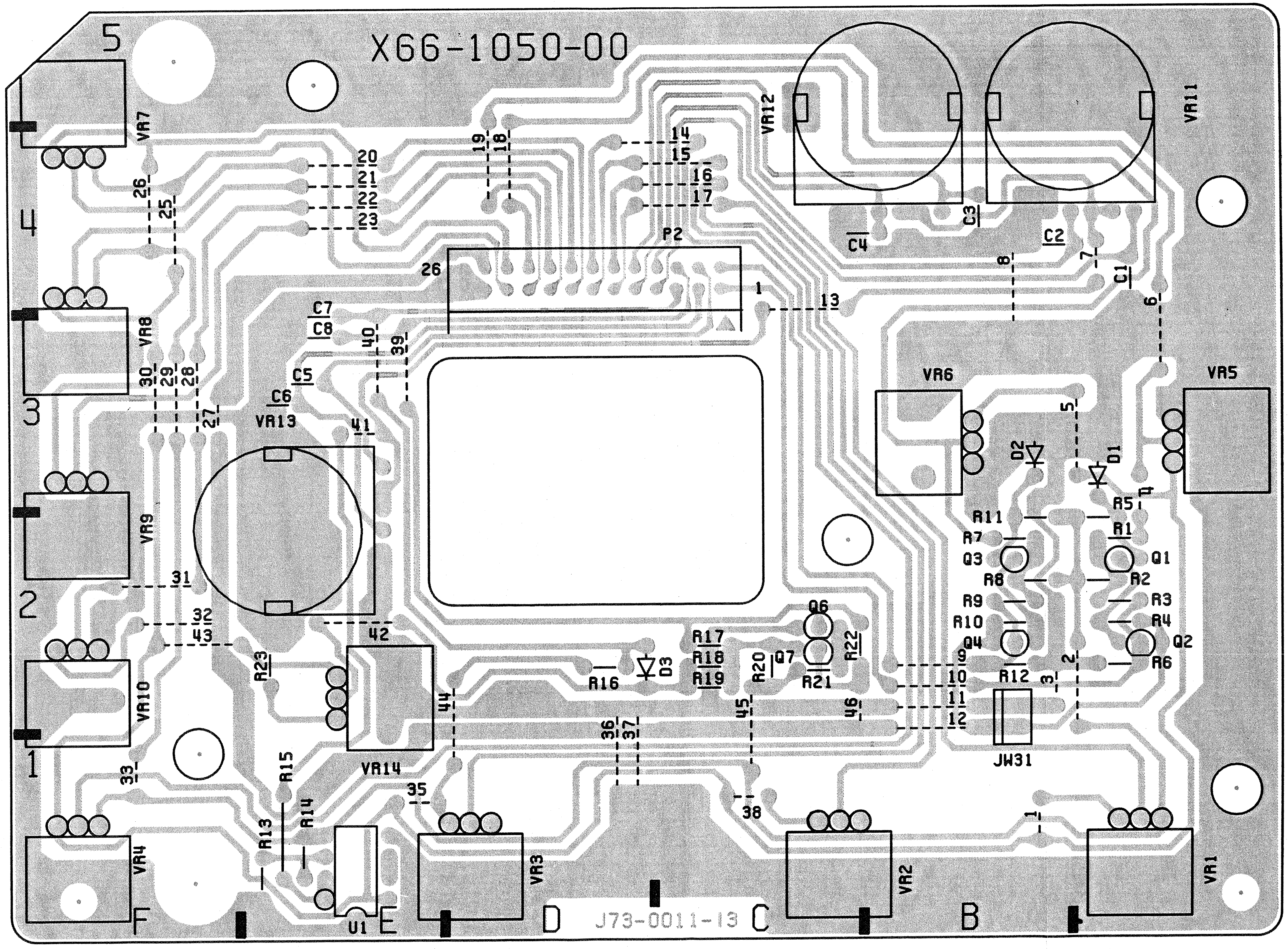
U8	TV COUNT		Ohter
Pin1	H		L
Pin 2	L		H
	When TV COUNT + A SWEEP is faster than 0.2 ms		Ohter
Pin 3	H		L
	When TV COUNT: SLOPE "+"		SLOPE "−"
Pin 15	L		H

U5	When TV signal is input	When TV signal is not present
Pin 13	H	L
	When INTERLACED signal is input	When PROGRESSIVE signal is input
Pin 5	H	L
Pin 12	L	H

P.C BOARD

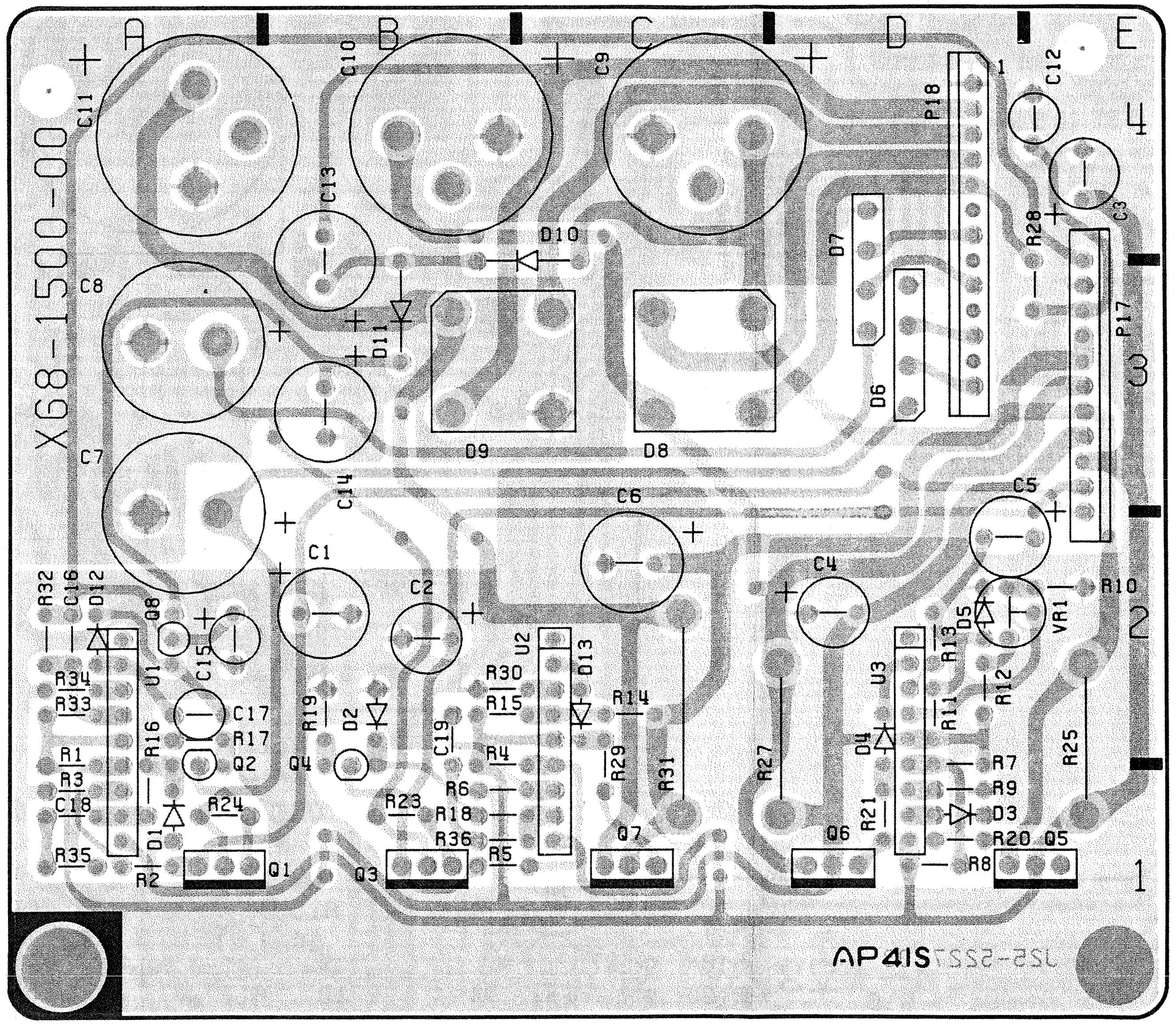
PANEL UNIT (X66-1050-01)

Pattern side view


X66-1050-00
J73-0011-13
P2
VR1
VR2
VR3
VR4
VR5
VR6
VR7
VR8
VR9
VR10
VR11
VR12
VR13
VR14
C1
C2
C3
C4
C5
C6
C7
C8
D1
D2
D3
Q1
Q2
Q3
Q4
Q6
Q7
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
U1
JW31
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
25
26
27
28
29
30
31
32
33
35
36
37
38
39
40
41
42
43
44
45
46
A
B
C
D
E
F

P.C BOARD

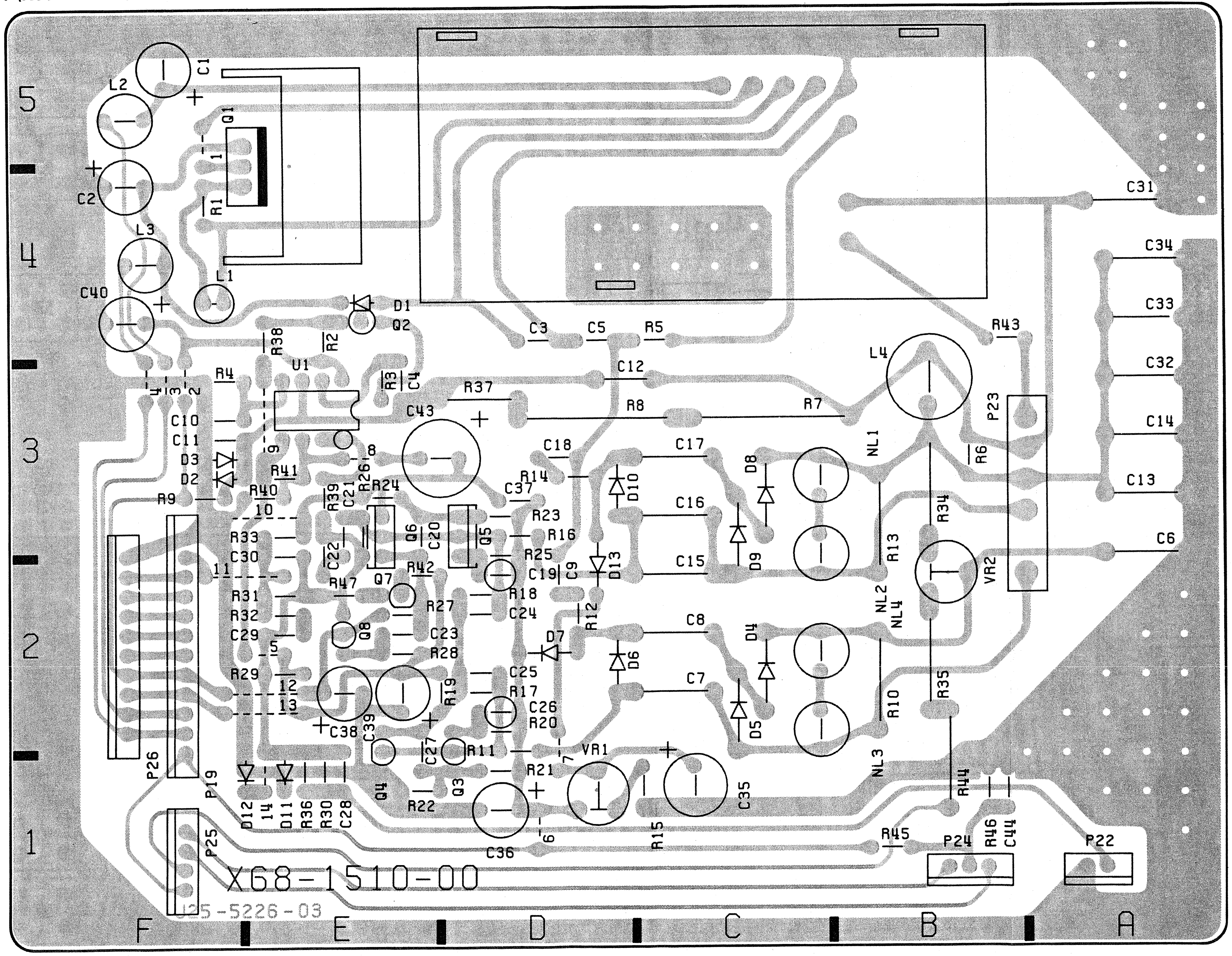
POWER SUPPLY UNIT (X68-1500-01)


A
B
C
D
E
4
3
2
1
X68-1500-00
C11
C10
C9
C12
C13
C3
C8
C7
C14
D10
D11
D7
D6
D9
D8
P18
P17
R28
C6
C5
C4
C1
C2
C15
C16
C17
C18
C19
R32
D12
Q8
U1
U2
U3
R34
R33
R16
R17
Q2
R19
D2
Q4
R1
R3
R35
D1
R2
R24
Q1
Q3
R23
R6
R18
R36
R5
R30
R15
R4
D13
R14
R29
R31
Q7
R27
D4
R21
Q6
R13
R11
D5
VR1
R10
R12
R7
R9
D3
R20
Q5
R8
R25
AP4IS

P.C BOARD

HIGH VOLTAGE UNIT (X68-1510-03)

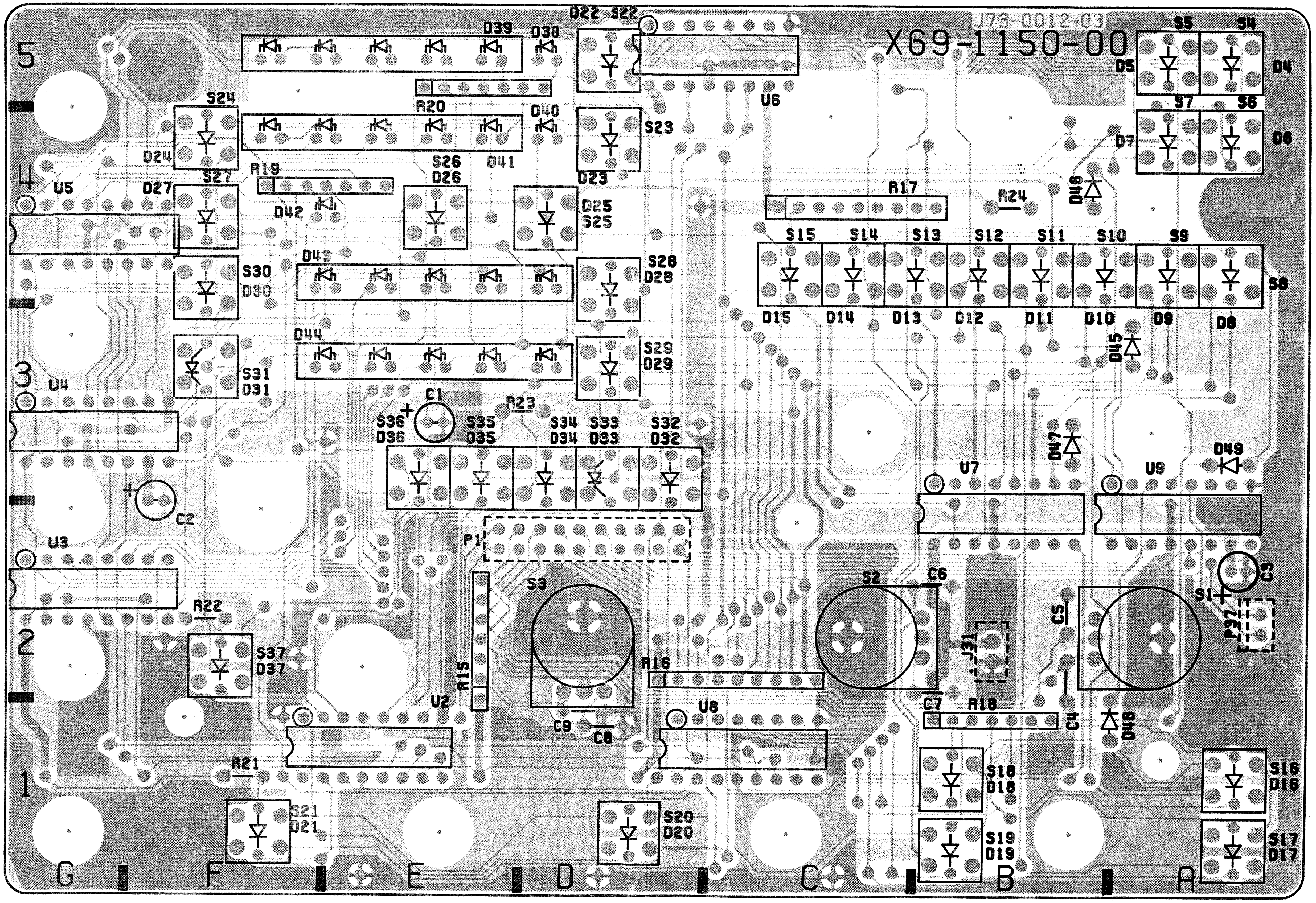
Pattern side view


5
4
3
2
1
F
E
D
C
B
A
C1
L2
Q1
C2
R1
L3
L1
C40
D1
Q2
R38
R2
U1
R4
R3
C4
C10
C11
D3
D2
R9
R41
R40
R39
R26
R24
C21
R33
C30
C22
Q6
C20
Q5
R31
R32
C29
R47
Q7
R42
R27
Q8
C23
R28
R29
C38
C39
R19
C27
R11
D12
D11
R36
R30
C28
Q4
Q3
R22
C36
VR1
C35
R15
R21
C3
C5
R5
C12
R37
R8
R7
C43
C18
C17
R14
C37
R23
R16
R25
C19
C9
R18
C24
R12
D7
C25
R17
C26
R20
D10
D13
C16
C15
D6
C8
C7
D8
D9
D4
D5
NL1
R13
NL2
NL4
R10
NL3
L4
R34
VR2
R35
R43
P23
R6
R44
R45
P24
R46
C44
P22
C31
C34
C33
C32
C14
C13
C6
P26
P19
P25
X68-1510-00
J25-5226-03

P.C BOARD

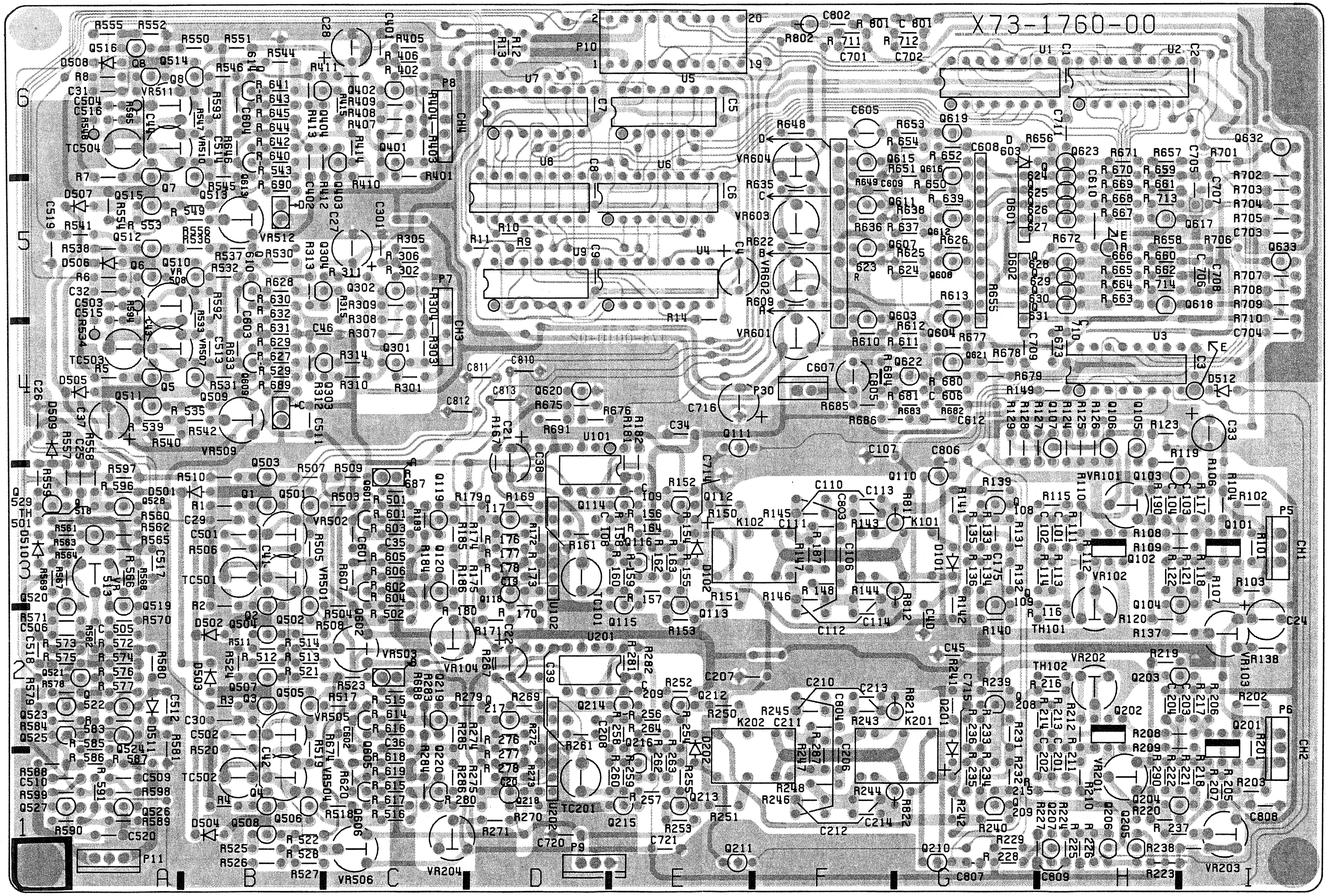
SWITCH UNIT (X69-1150-02)

Pattern side view


X69-1150-00
J73-0012-03
5
4
3
2
1
G
F
E
D
C
B
A
D39
D38
D22
S22
S5
S4
D5
D4
S7
S6
D7
D6
U6
R20
D40
S24
S23
D24
S27
R19
S26
D26
D41
D23
U5
D27
D42
D25
S25
R17
R24
D46
S15
S14
S13
S12
S11
S10
S9
S8
D43
S30
D30
S28
D28
D15
D14
D13
D12
D11
D10
D9
D8
D44
S29
D29
D45
S31
D31
U4
C1
R23
S36
D36
S35
D35
S34
D34
S33
D33
S32
D32
D47
D49
U7
U9
C2
U3
P1
C3
S3
S2
C6
S1
R22
C5
P37
J31
S37
D37
R15
R16
U2
U8
C9
C8
C7
R18
C4
D48
R21
S18
D18
S16
D16
S21
D21
S20
D20
S19
D19
S17
D17

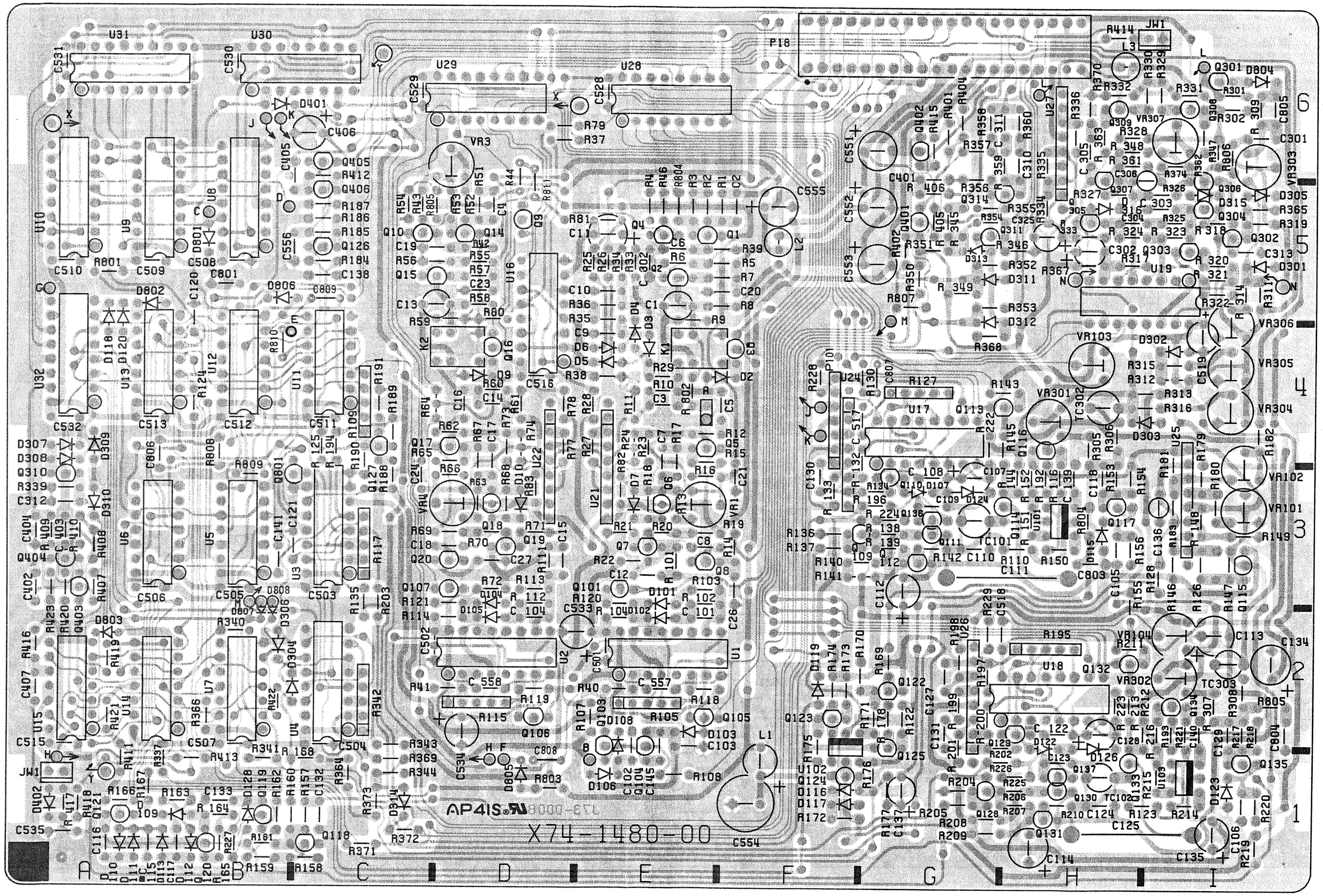
P.C BOARD

VERTICAL PREAMP UNIT (X73-1760-01)


X73-1760-00
P10
P8
P7
P30
P5
P6
P9
P11
CH1
CH2
CH3
CH4
U1
U2
U3
U4
U5
U6
U7
U8
U9
U101
U102
U201
U202
K101
K102
K201
K202
VR101
VR102
VR103
VR104
VR201
VR202
VR203
VR204
A
B
C
D
E
F
G
H
I
1
2
3
4
5
6

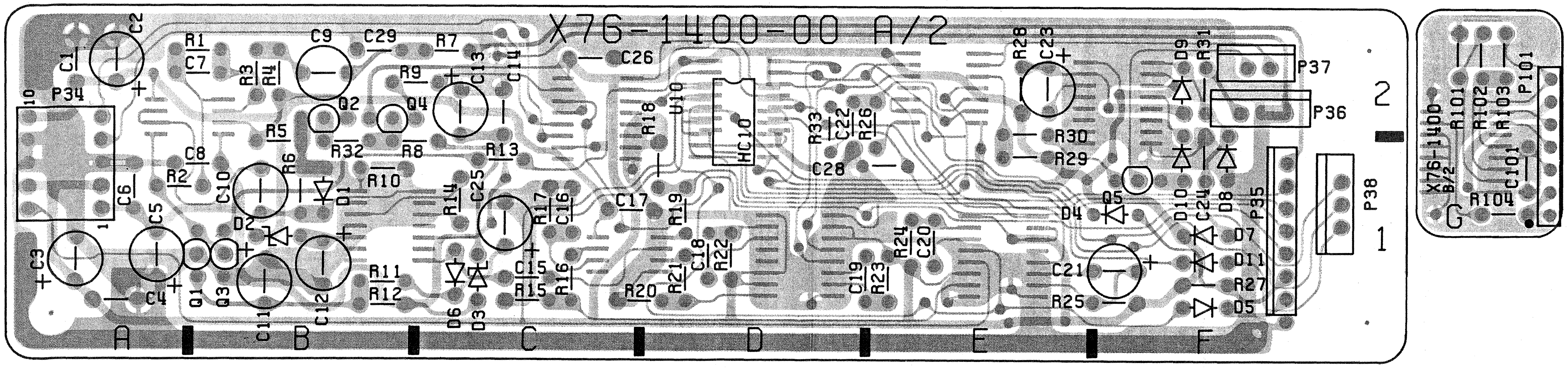
P.C BOARD

HORIZONTAL UNIT (X74-1480-03)


X74-1480-00
AP4IS
A
B
C
D
E
F
G
H
I
1
2
3
4
5
6

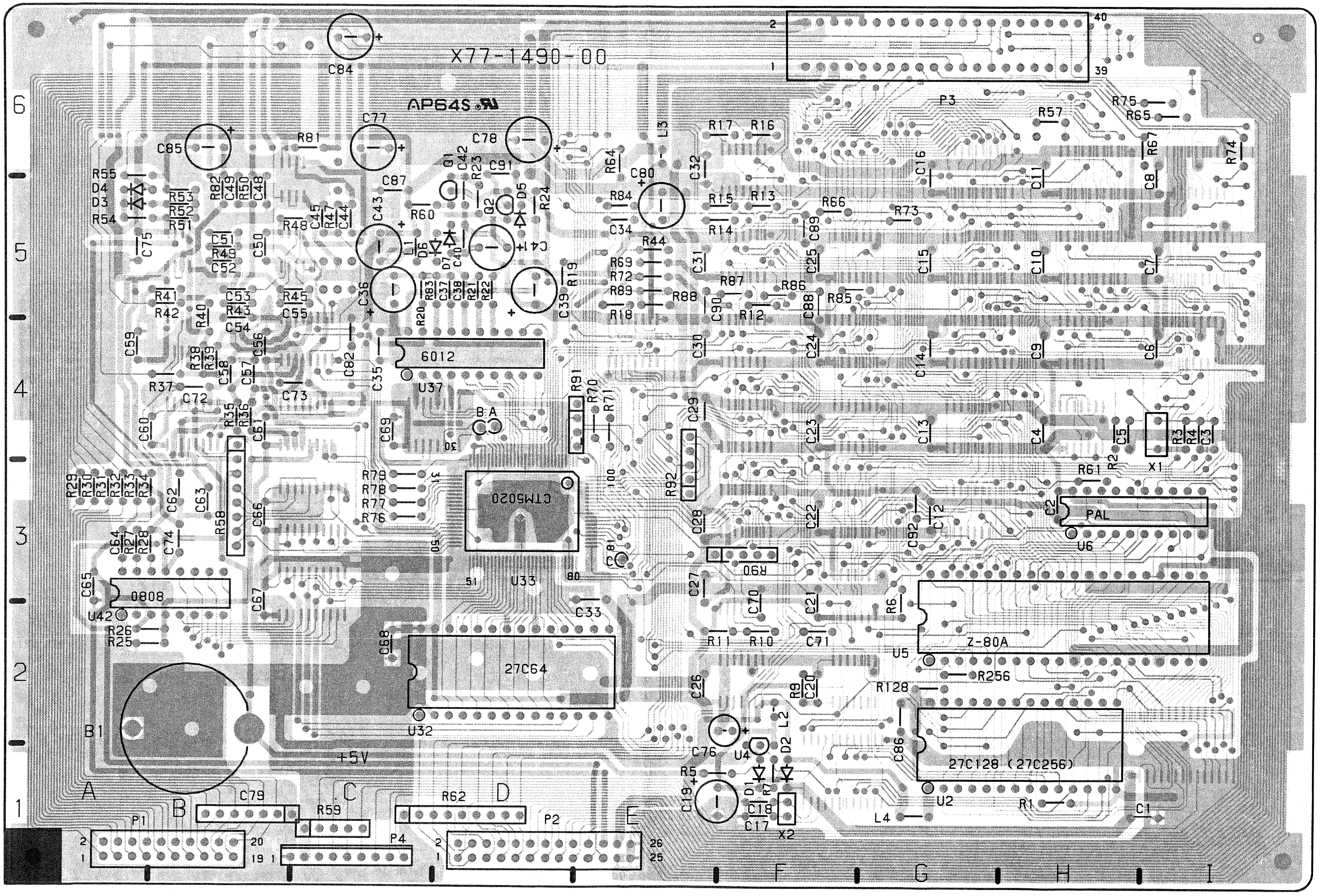
P.C BOARD

LINE COUNTER UNIT (X76-1400-00)


X76-1400-00 A/2
X76-1400 B/2
P34
P35
P36
P37
P38
P101
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23 C24 C25 C26 C28 C29 C101
R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23 R24 R25 R26 R27 R28 R29 R30 R31 R32 R33 R101 R102 R103 R104
Q1 Q2 Q3 Q4 Q5
D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11
U10
HC10
A
B
C
D
E
F
G
1
2
10

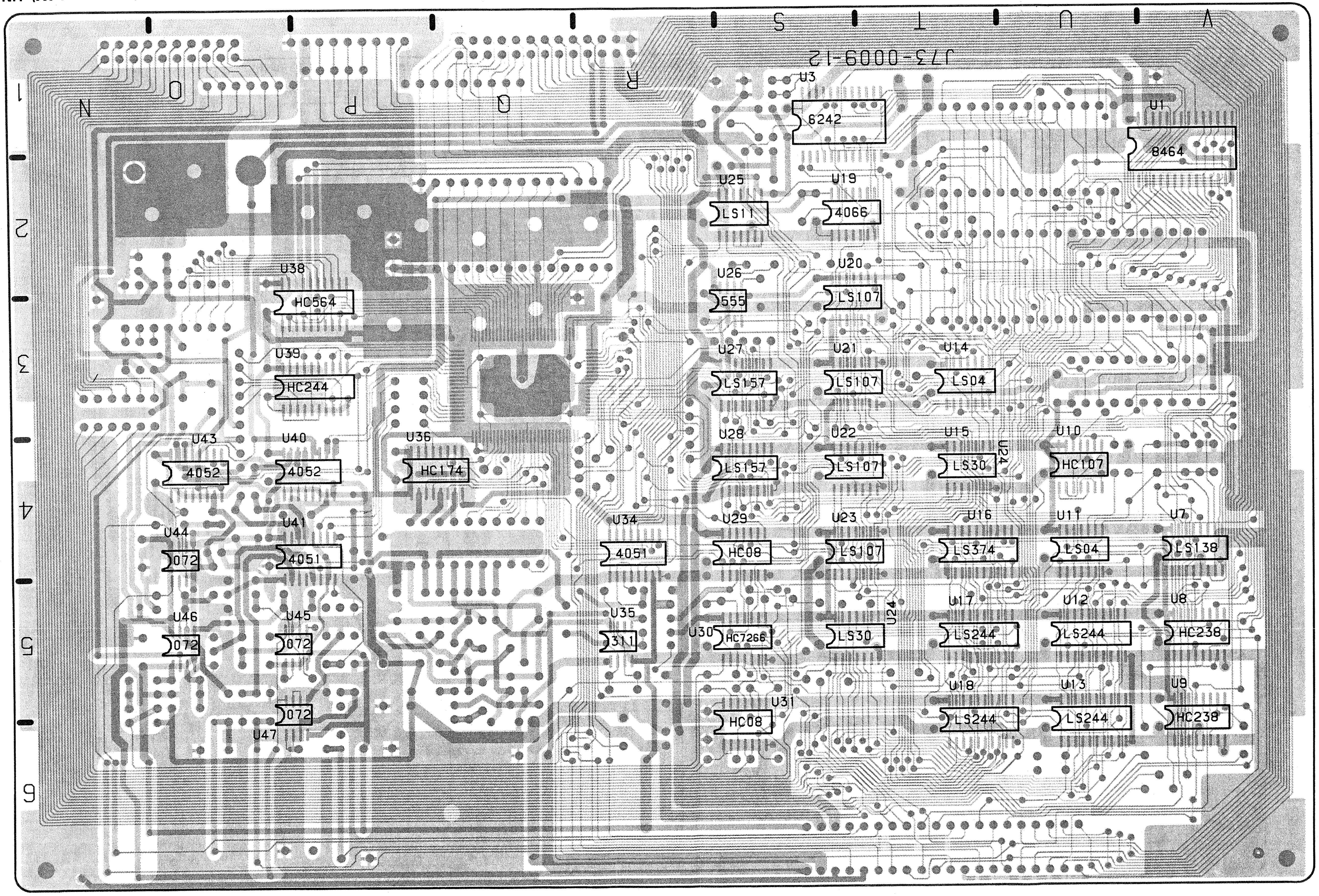
P.C BOARD

R/O UNIT (X77-1490-01) A


X77-1490-00
AP64S
C84
C85
C77
C78
R81
R55
D4
D3
R54
R53
R52
R51
R82
C49
R50
C48
C45
R47
C44
R48
C43
C87
Q1
C42
R23
C91
Q2
D5
R24
R60
L1
D6
D7
C40
C41
C75
C51
R49
C52
C50
C36
R83
C37
C38
R21
R22
R19
C39
R41
R42
R40
C53
R43
C54
C56
R45
C55
R20
6012
U37
C82
C35
C59
R38
R39
C58
C57
R37
C72
C73
R35
R36
C61
C60
C69
B A
30
31
R79
R78
R77
R76
CTM5020
U33
50
51
80
100
R29
R30
R31
R32
R33
R34
C62
C63
R58
C66
C64
R27
R28
C74
C65
0808
U42
C67
R26
R25
C68
27C64
U32
B1
+5V
C33
R91
R70
R71
C81
R64
C80
R84
C34
R44
R69
R72
R89
R18
R88
L3
C32
R17
R16
R15
R13
R14
C31
R87
R86
C90
R12
C30
C29
R92
C28
R90
C27
C70
R11
R10
C26
C76
U4
R5
C19
D1
R7
D2
L2
C18
C17
X2
R9
C20
C71
C21
C22
C23
C24
C25
C88
R85
C89
R66
R73
C16
C15
C14
C13
C12
C92
P3
R57
C11
C10
C9
C4
R75
R65
R67
R74
C8
C7
C6
C5
R3
R4
C3
X1
R2
R61
C2
PAL
U6
R6
Z-80A
U5
R256
R128
C86
27C128 (27C256)
U2
R1
C1
L4
2
1
40
39
P1
2
1
20
19
C79
R59
P4
R62
P2
26
25
A
B
C
D
E
F
G
H
I
1
2
3
4
5
6

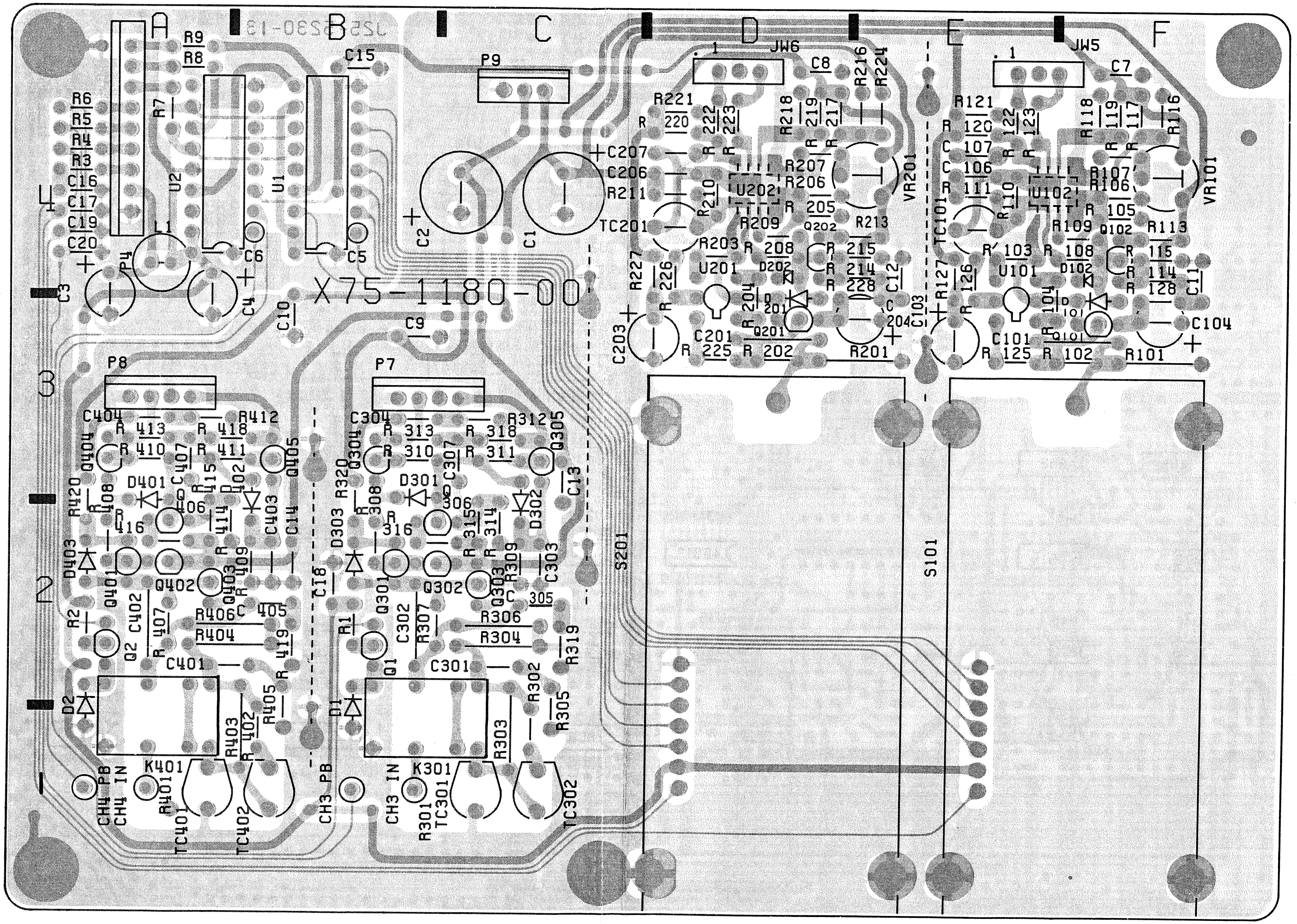
P.C BOARD

R/O UNIT (X77-1490-01) B


N
O
P
Q
R
S
T
U
V
1
2
3
4
5
6
J73-0009-12
U3
6242
U1
8464
U25
LS11
U19
4066
U26
555
U20
LS107
U38
HC564
U27
LS157
U21
LS107
U14
LS04
U39
HC244
U28
LS157
U22
LS107
U15
LS30
U10
HC107
U43
4052
U40
4052
U36
HC174
U34
4051
U29
HC08
U23
LS107
U16
LS374
U11
LS04
U7
LS138
U44
072
U41
4051
U35
311
U30
HC7266
U24
LS30
U17
LS244
U12
LS244
U8
HC238
U46
072
U45
072
U31
HC08
U18
LS244
U13
LS244
U9
HC238
072
U47

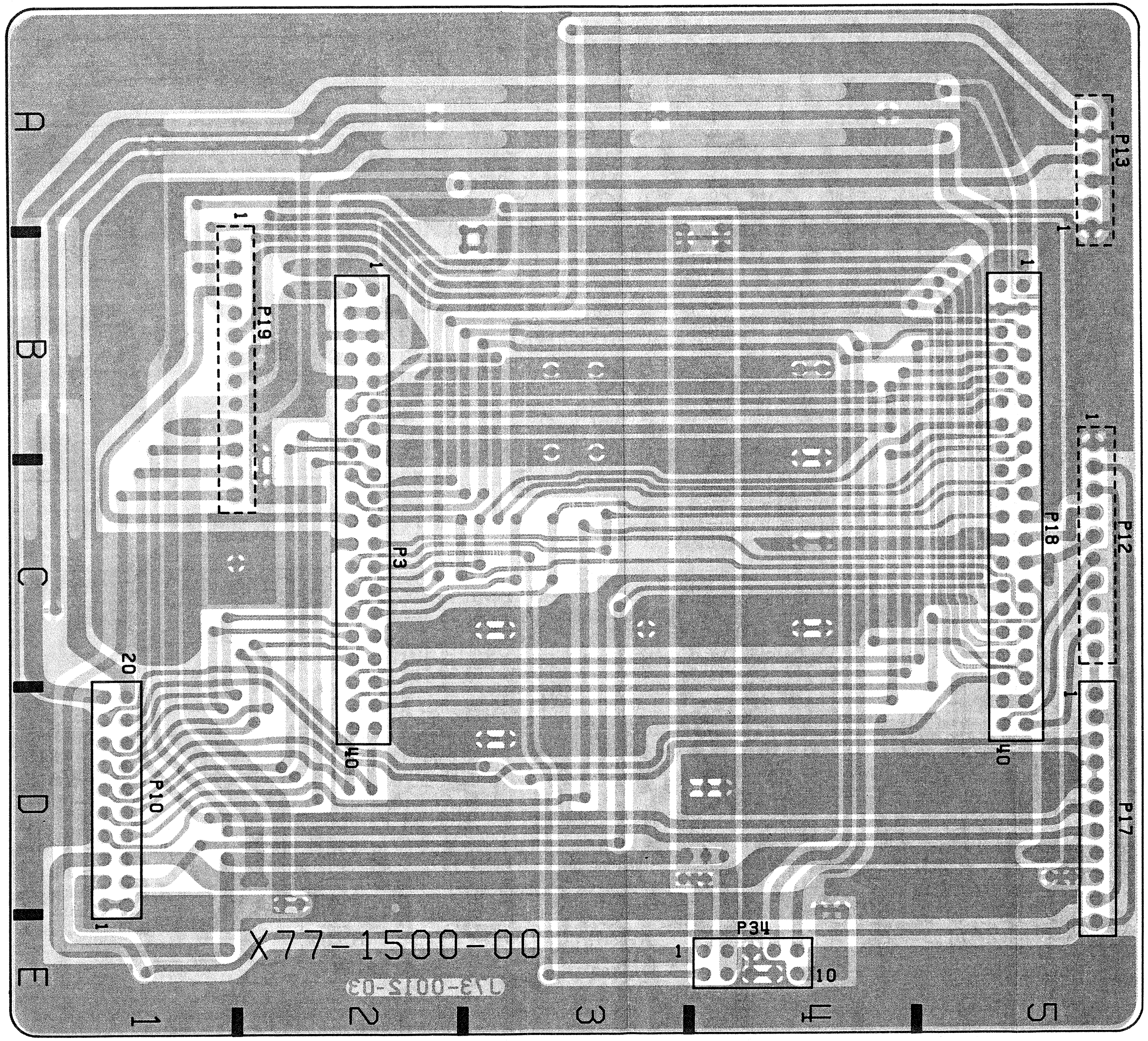
P.C BOARD

ATT UNIT (X75-1180-01)


A
B
C
D
E
F
4
3
2
1
R9
R8
C15
P9
JW6
C8
R216
R224
JW5
C7
R6
R5
R4
R3
C16
C17
C19
C20
R7
U2
U1
L1
C6
C5
C2
C1
P4
C3
C4
C10
X75-1180-00
C9
C207
C206
R211
TC201
R221
220
222
223
R218
219
217
R207
R206
U202
R210
205
R209
Q202
R213
VR201
R203
208
215
214
228
C12
R227
226
U201
D202
204
D201
Q201
C201
225
202
R201
C203
C204
C103
R127
126
TC101
R121
120
107
106
111
122
123
R118
119
117
R116
R107
R106
U102
110
105
R109
Q102
R113
VR101
103
108
115
114
128
C11
U101
D102
104
D101
Q101
C101
125
102
R101
C104
P8
P7
C404
R412
413
418
410
411
Q404
C407
Q405
D401
415
402
R420
408
406
414
C403
C14
416
D403
Q401
Q402
Q403
409
C405
R406
R404
C402
407
Q2
R2
419
C401
D2
K401
R403
402
R405
CH4 PB
CH4 IN
R401
TC401
TC402
C304
R312
313
318
310
311
Q304
C307
Q305
D301
306
R320
308
D303
316
315
314
D302
C13
R309
C303
Q301
Q302
Q303
305
C18
C302
R307
R306
R304
R1
Q1
C301
R319
R302
R305
D1
K301
R303
CH3 PB
CH3 IN
R301
TC301
TC302
S201
S101

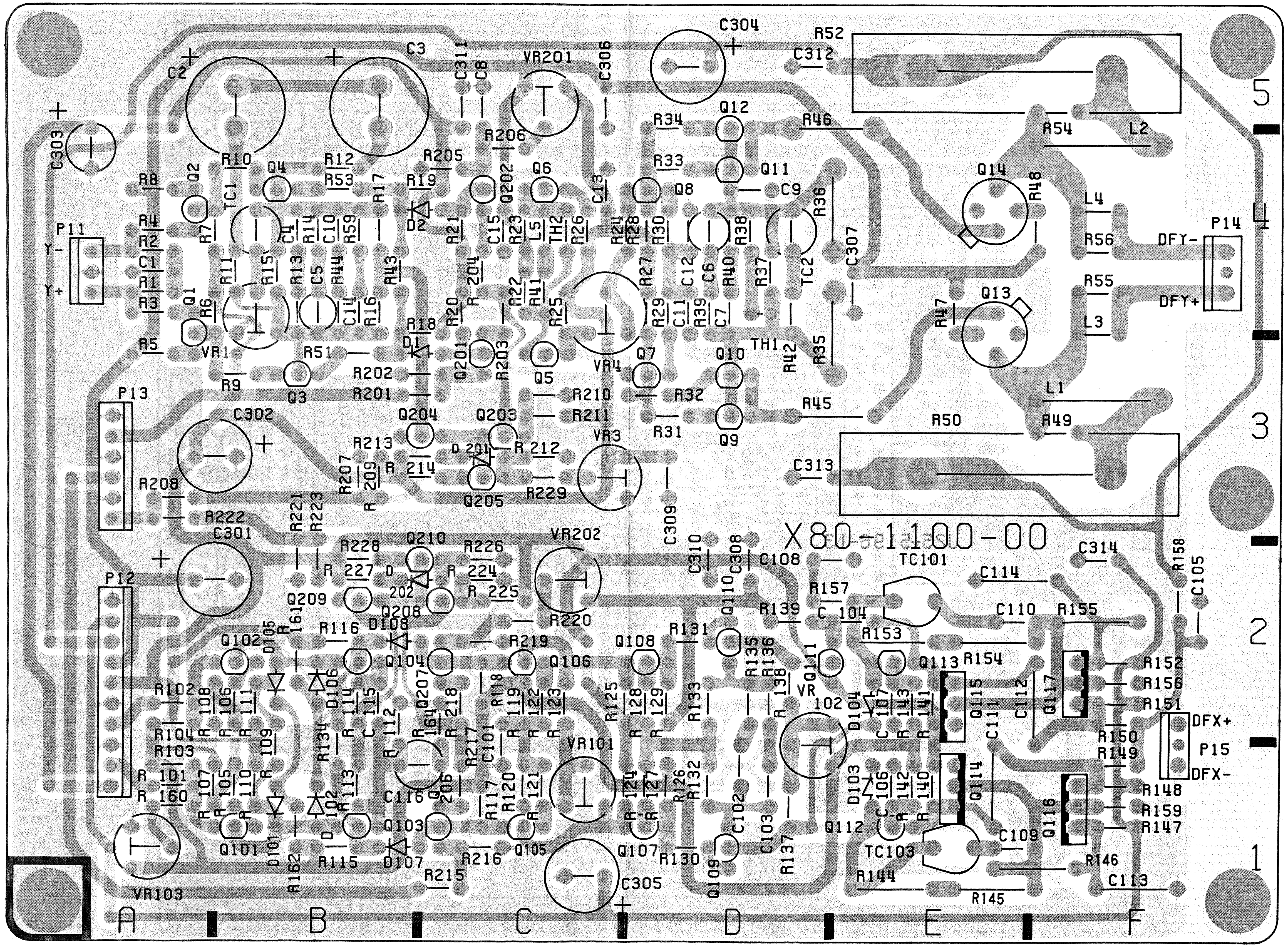
P.C BOARD

CONNECTION UNIT (X77-1500-01)


A
B
C
D
E
1
2
3
4
5
P13
P19
P3
P18
P12
P10
P17
P34
1
20
40
10
X77-1500-00

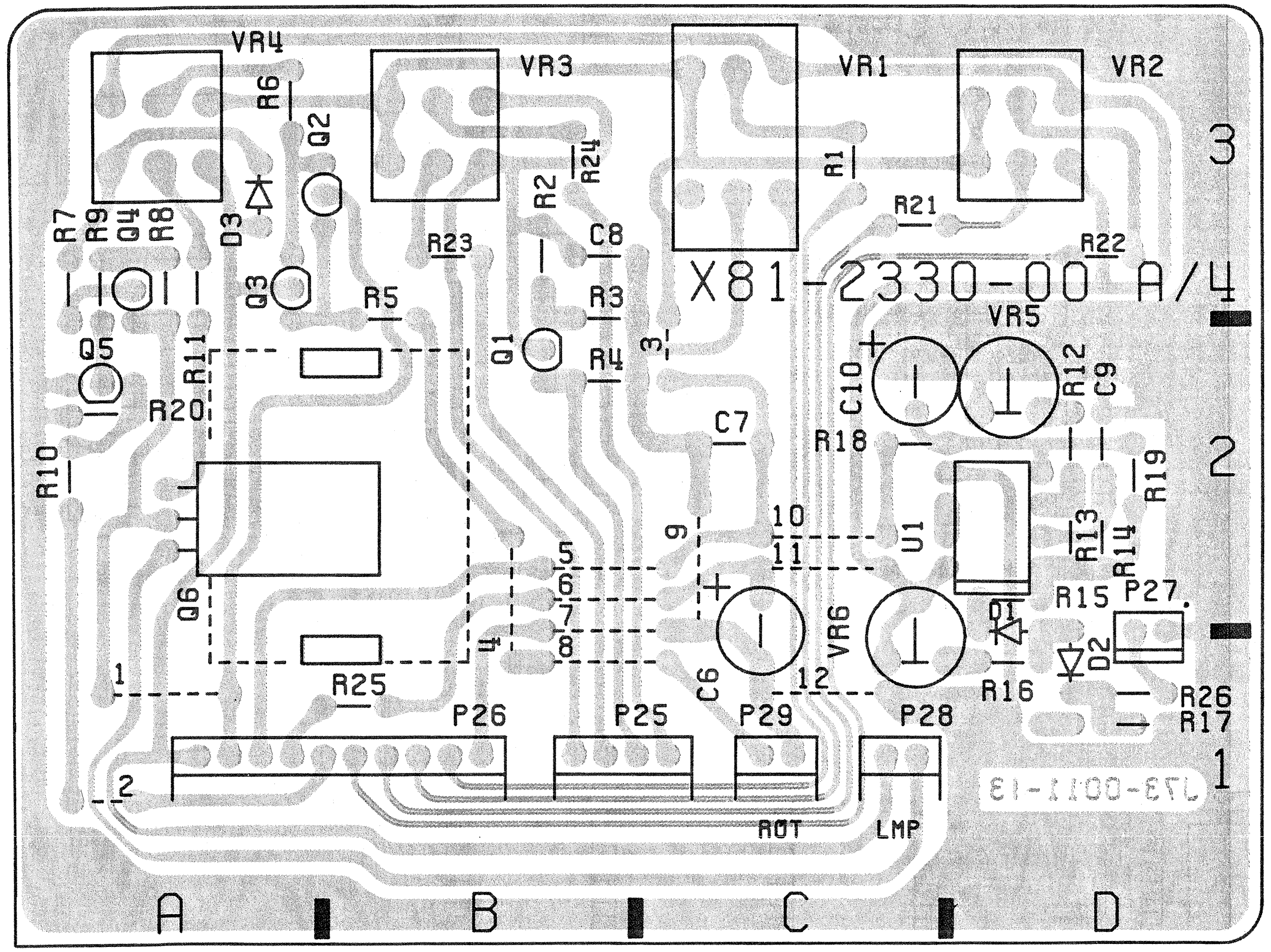
P.C BOARD

FINAL UNIT (X80-1100-03)

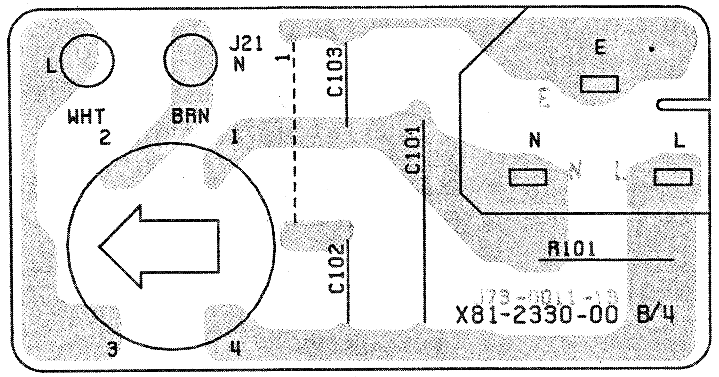

C304
R52
C312
C2
C3
C311
C8
VR201
C306
C303
R34
Q12
R46
R54
L2
5
R206
R10
Q4
R12
R205
R33
Q11
R8
Q2
R53
R17
R19
Q202
Q6
C13
Q8
C9
Q14
R48
TC1
D2
R36
L4
P11
R4
R7
C4
R14
C10
R59
R21
C15
R23
L5
TH2
R26
R24
R28
R30
R38
4
Y-
R2
R56
DFY-
P14
C1
R11
R15
R13
C5
R44
R43
R204
R27
C12
C6
R40
R37
TC2
C307
Y+
R1
R22
R41
R25
R29
C11
R39
C7
R47
Q13
R55
DFY+
R3
Q1
R6
C14
R16
R18
R20
R203
Q201
L3
R5
VR1
R51
D1
Q5
VR4
Q7
Q10
TH1
R42
R35
R9
Q3
R202
R201
R210
R32
L1
P13
C302
Q204
Q203
R211
R31
Q9
R45
R50
R49
3
R213
D201
R212
VR3
R207
R209
R214
C313
R208
Q205
R229
R222
R221
R223
C309
X80-1100-00
C301
R228
Q210
R226
VR202
C310
C308
C108
TC101
C314
R158
R227
D202
R224
Q110
C105
P12
R225
R157
C114
Q209
Q208
R220
R139
C104
C110
R155
D105
R161
R116
D108
R131
R153
2
Q102
R219
Q108
R135
R136
Q111
Q113
R154
Q104
Q106
R152
D106
Q207
R118
R156
R102
R108
R106
R111
R114
C115
R218
R119
R122
R123
R125
R128
R129
R133
R138
VR102
D104
C107
R143
R141
Q115
C112
Q117
R151
R112
R164
DFX+
R104
R109
R134
R217
C101
R150
P15
R103
VR101
R149
R101
R107
R105
R110
R113
R206
R117
R120
R121
R124
R127
R126
R132
D103
C106
R142
R140
Q114
DFX-
R160
D102
C116
Q116
R148
R159
Q103
Q112
R147
C102
C103
Q101
Q107
R137
TC103
C109
1
D101
R115
D107
R216
Q105
R130
R146
R162
R215
Q109
R144
C113
VR103
C305
R145
A
B
C
D
E
F

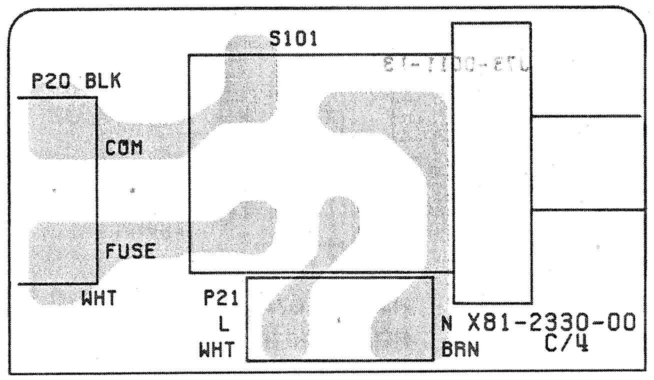
P.C BOARD

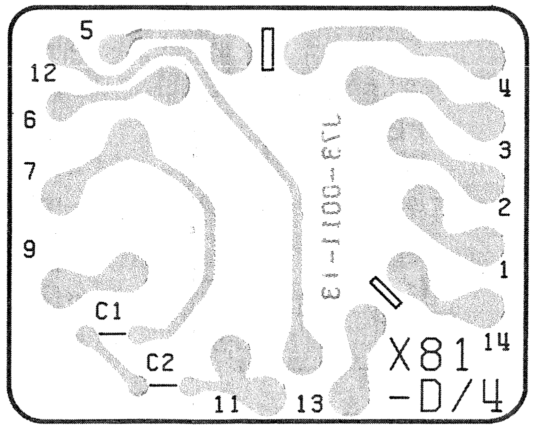
VOLUME UNIT (X81-2330-03)


VR4
VR3
VR1
VR2
R6
Q2
R24
R2
R1
R21
R22
C8
R23
R7
R9
Q4
R8
D3
Q3
R5
R3
Q1
R4
X81-2330-00 A/4
VR5
C10
R12
C9
Q5
R11
R20
C7
R18
R10
R19
U1
R13
R14
10
11
9
5
6
7
8
3
4
Q6
C6
VR6
D1
R15
P27
D2
R16
R26
R17
12
1
2
R25
P26
P25
P29
P28
ROT
LMP
A
B
C
D
3
2
1

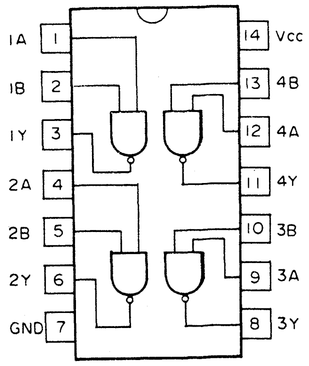
Pattern side view


L
J21
N
1
WHT
2
BRN
1
C103
C101
C102
E
N
L
R101
X81-2330-00 B/4
3
4

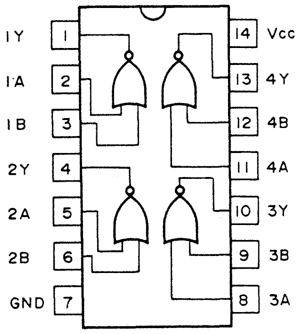

S101
P20 BLK
COM
FUSE
WHT
P21
L
WHT
N X81-2330-00
BRN
C/4


5
12
6
7
9
C1
C2
11
13
X81
-D/4
14
4
3
2
1

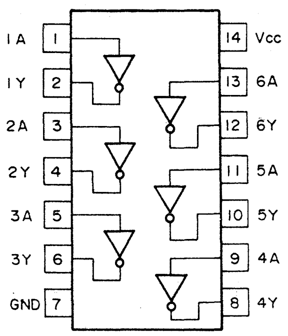
SEMICONDUCTORS


1A 1
1B 2
1Y 3
2A 4
2B 5
2Y 6
GND 7
14 Vcc
13 4B
12 4A
11 4Y
10 3B
9 3A
8 3Y

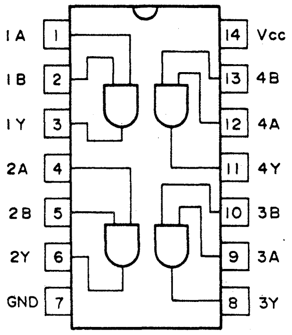
SN74ALS00AN
HD74HC00FP


1Y 1
1A 2
1B 3
2Y 4
2A 5
2B 6
GND 7
14 Vcc
13 4Y
12 4B
11 4A
10 3Y
9 3B
8 3A

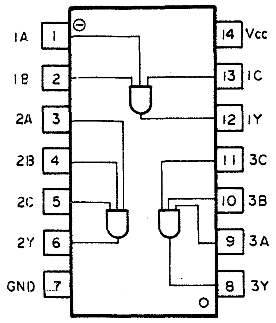
SN74ALS02N


1A 1
1Y 2
2A 3
2Y 4
3A 5
3Y 6
GND 7
14 Vcc
13 6A
12 6Y
11 5A
10 5Y
9 4A
8 4Y

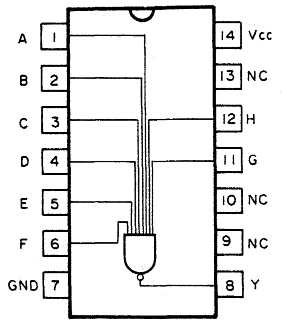
HD74LS04FP


1A 1
1B 2
1Y 3
2A 4
2B 5
2Y 6
GND 7
14 Vcc
13 4B
12 4A
11 4Y
10 3B
9 3A
8 3Y

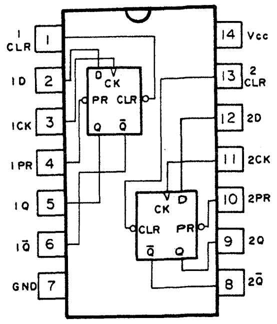
SN74ALS08N
HD74HC08FP


1A 1
1B 2
2A 3
2B 4
2C 5
2Y 6
GND 7
14 Vcc
13 1C
12 1Y
11 3C
10 3B
9 3A
8 3Y

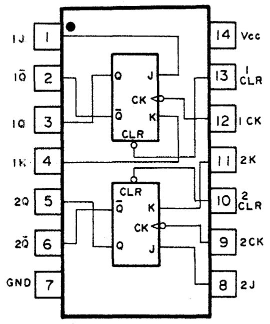
HD74LS11FP


A 1
B 2
C 3
D 4
E 5
F 6
GND 7
14 Vcc
13 NC
12 H
11 G
10 NC
9 NC
8 Y

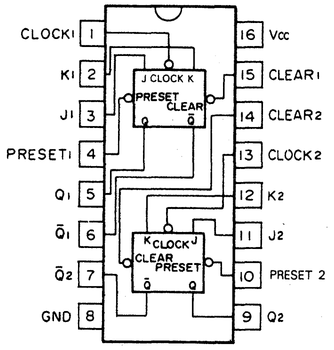
HD74LS30FP


1 CLR 1
1D 2
1CK 3
1PR 4
1Q 5
1Q̄ 6
GND 7
14 Vcc
13 2 CLR
12 2D
11 2CK
10 2PR
9 2Q
8 2Q̄
CK
PR
CLR
D
Q
Q̄

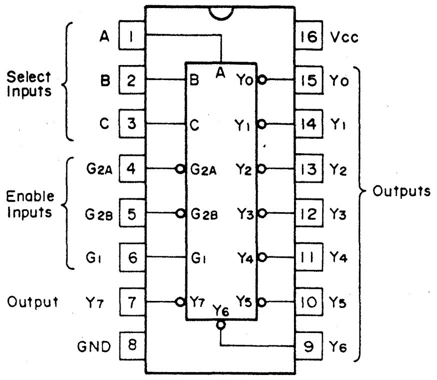
SN74ALS74AN


1J 1
1Q̄ 2
1Q 3
1K 4
2Q 5
2Q̄ 6
GND 7
14 Vcc
13 1 CLR
12 1CK
11 2K
10 2 CLR
9 2CK
8 2J
CK
CLR
J
K
Q
Q̄

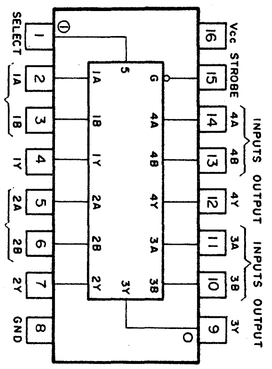
HD74LS107AFP
HD74HC107FP


CLOCK1 1
K1 2
J1 3
PRESET1 4
Q1 5
Q̄1 6
Q̄2 7
GND 8
16 Vcc
15 CLEAR1
14 CLEAR2
13 CLOCK2
12 K2
11 J2
10 PRESET 2
9 Q2
J CLOCK K
PRESET
CLEAR
K CLOCK J
CLEAR
PRESET

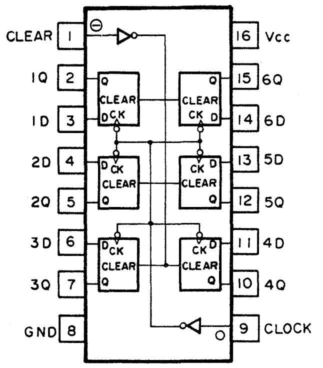
SN74ALS112AN


Select Inputs
A 1
B 2
C 3
Enable Inputs
G2A 4
G2B 5
G1 6
Output Y7 7
GND 8
16 Vcc
15 Y0
14 Y1
13 Y2
12 Y3
11 Y4
10 Y5
9 Y6
Outputs

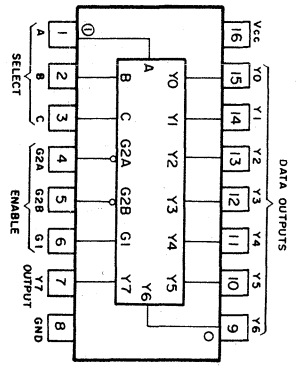
HD74LS138FP


SELECT 1
1A 2
1B 3
1Y 4
2A 5
2B 6
2Y 7
GND 8
16 Vcc
15 STROBE
14 4A
13 4B
12 4Y
11 3A
10 3B
9 3Y
INPUTS
OUTPUT

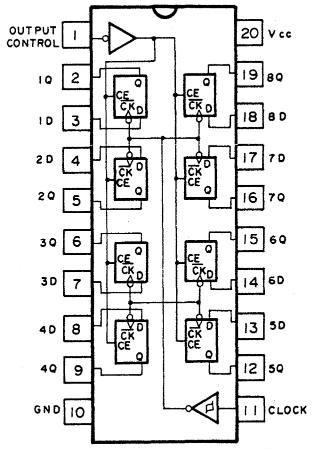
HD74LS157FP


CLEAR 1
1Q 2
1D 3
2D 4
2Q 5
3D 6
3Q 7
GND 8
16 Vcc
15 6Q
14 6D
13 5D
12 5Q
11 4D
10 4Q
9 CLOCK
CLEAR
CK
D
Q

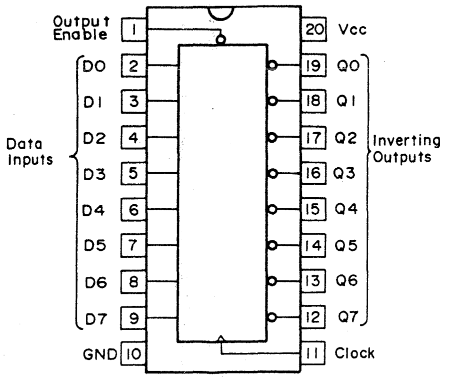
HD74HC174FP


SELECT
A 1
B 2
C 3
ENABLE
G2A 4
G2B 5
G1 6
OUTPUT Y7 7
GND 8
16 Vcc
15 Y0
14 Y1
13 Y2
12 Y3
11 Y4
10 Y5
9 Y6
DATA OUTPUTS

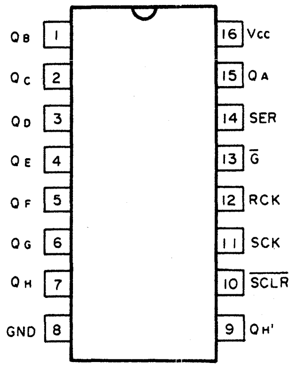
HD74LS374FP


OUTPUT CONTROL 1
1Q 2
1D 3
2D 4
2Q 5
3Q 6
3D 7
4D 8
4Q 9
GND 10
20 Vcc
19 8Q
18 8D
17 7D
16 7Q
15 6Q
14 6D
13 5D
12 5Q
11 CLOCK
CE
CK
D
Q

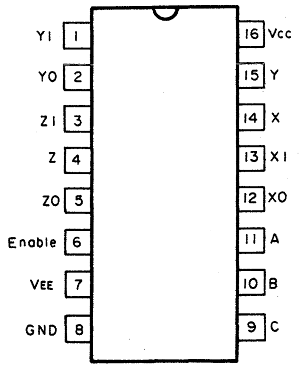
HD74HC238FP


Output Enable 1
Data Inputs
D0 2
D1 3
D2 4
D3 5
D4 6
D5 7
D6 8
D7 9
GND 10
20 Vcc
19 Q0
18 Q1
17 Q2
16 Q3
15 Q4
14 Q5
13 Q6
12 Q7
11 Clock
Inverting Outputs

HD74HC564FP

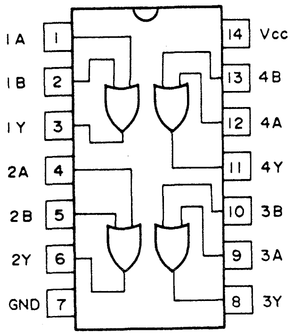

QB 1
QC 2
QD 3
QE 4
QF 5
QG 6
QH 7
GND 8
16 Vcc
15 QA
14 SER
13 Ḡ
12 RCK
11 SCK
10 SCLR
9 QH'

HD74HC595FP
HD74HC595AP

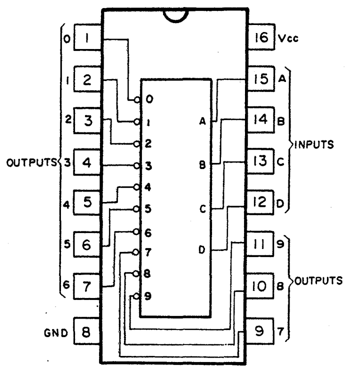

Y1 1
Y0 2
Z1 3
Z 4
Z0 5
Enable 6
VEE 7
GND 8
16 Vcc
15 Y
14 X
13 X1
12 X0
11 A
10 B
9 C

MC74HC4053N

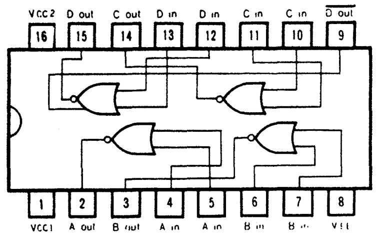
SEMICONDUCTORS


1A
1B
1Y
2A
2B
2Y
GND
Vcc
4B
4A
4Y
3B
3A
3Y

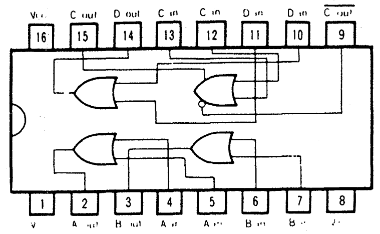
SN74ALS32N


OUTPUTS
GND
Vcc
INPUTS
OUTPUTS
A
B
C
D

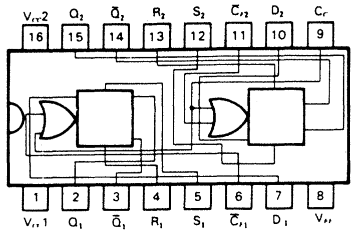
HD74LS42P



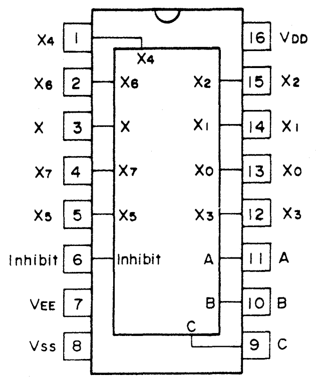
MC10H102L



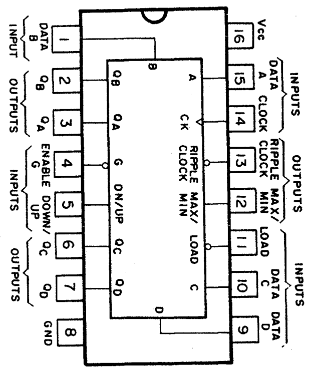
MC10103L



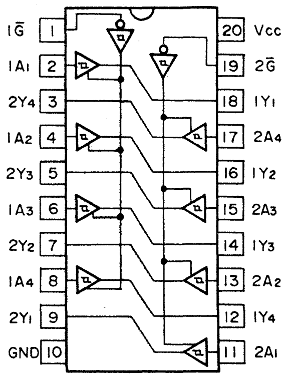
MC10H131L


X4
X6
X
X7
X5
Inhibit
VEE
Vss
VDD
X2
X1
X0
X3
A
B
C

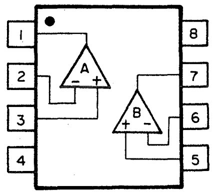
HD14051BFP


DATA INPUT
OUTPUTS
ENABLE
DOWN/UP
OUTPUTS
GND
Vcc
INPUTS
OUTPUTS
RIPPLE CLOCK
MAX/MIN
LOAD
INPUTS

SN74ALS191N

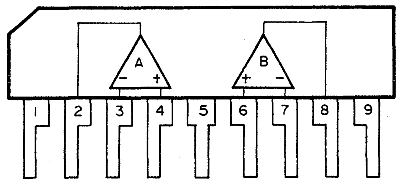

1G
1A1
2Y4
1A2
2Y3
1A3
2Y2
1A4
2Y1
GND
Vcc
2G
1Y1
2A4
1Y2
2A3
1Y3
2A2
1Y4
2A1

HD74LS244FP



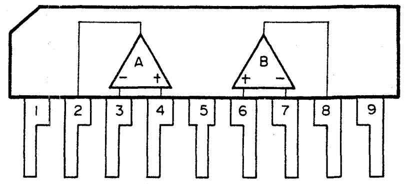
Pin name
1. A OUTPUT
2. A (−) INPUT
3. A (+) INPUT
4. V⁻
5. B (+) INPUT
6. B (−) INPUT
7. B OUTPUT
8. V⁺

NJM072M



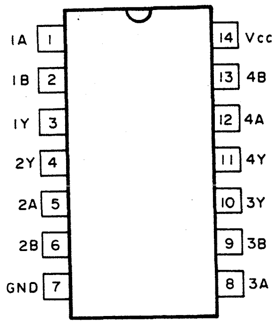
Pin name
1. V⁺
2. A OUTPUT
3. A (−) INPUT
4. A (+) INPUT
5. V⁻
6. B (+) INPUT
7. B (−) INPUT
8. B OUTPUT
9. V⁺

NJM072S

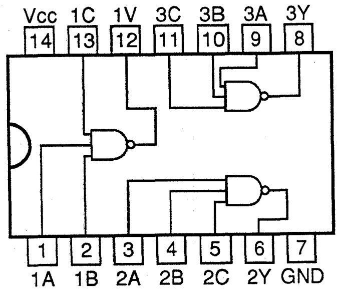


Pin name
1. V⁺
2. A OUTPUT
3. A − INPUT
4. A + INPUT
5. V⁻
6. B + INPUT
7. B − INPUT
8. B OUTPUT
9. V⁺

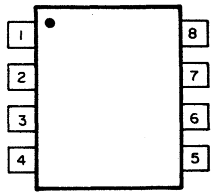
NJM4556S


1A
1B
1Y
2Y
2A
2B
GND
Vcc
4B
4A
4Y
3Y
3B
3A

HD74HC7266FP

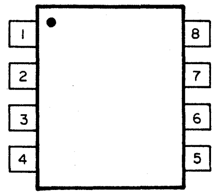

Vcc 1C 1V 3C 3B 3A 3Y
1A 1B 2A 2B 2C 2Y GND

HD74HC10CFP



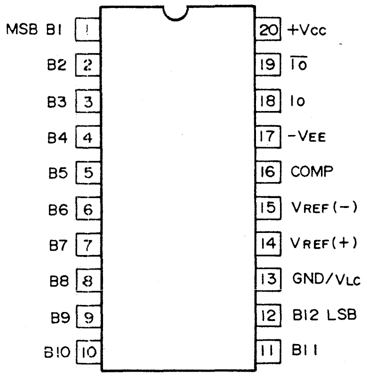
Pin name
1. GROUND
2. + INPUT
3. − INPUT
4. V⁻
5. BAL
6. BAL/STROBE
7. OUTPUT
8. V⁺

NJM311M

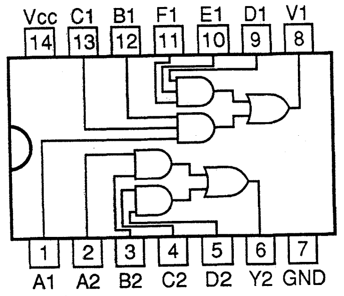


Pin name
1. GND
2. TRIGGER
3. OUTPUT
4. RESET
5. CONTROL VOLTAGE
6. SLESHHOLD
7. DISCHARGE
8. V⁺

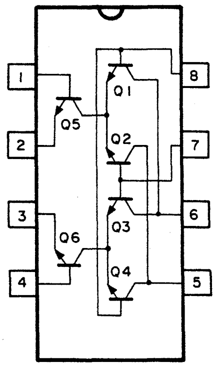
NJM555M


MSB B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
+Vcc
Io
Io
−VEE
COMP
VREF(−)
VREF(+)
GND/VLC
B12 LSB
B11

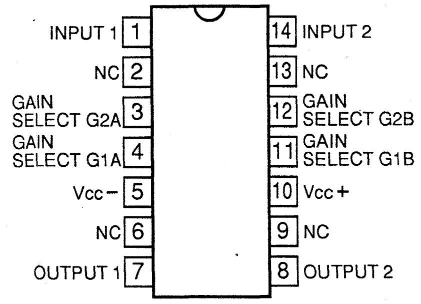
AM6012DC


Vcc C1 B1 F1 E1 D1 V1
A1 A2 B2 C2 D2 Y2 GND

MC74HC58F

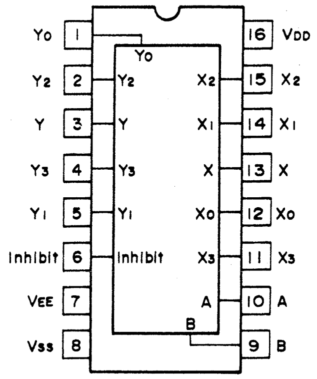

Q1
Q2
Q3
Q4
Q5
Q6

µPA101G

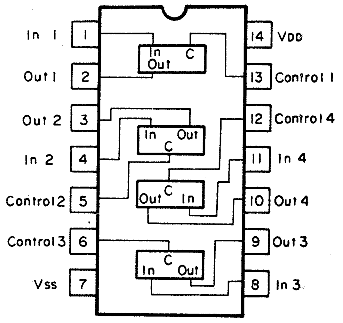

INPUT 1
NC
GAIN SELECT G2A
GAIN SELECT G1A
Vcc−
NC
OUTPUT 1
INPUT 2
NC
GAIN SELECT G2B
GAIN SELECT G1B
Vcc+
NC
OUTPUT 2

µA733CNS

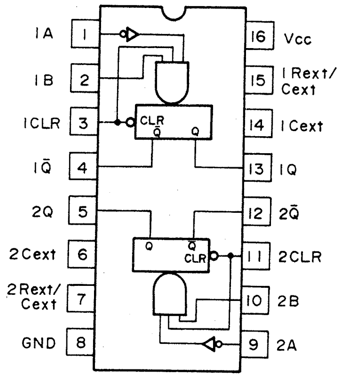
SEMICONDUCTORS


Y0 1
Y2 2
Y 3
Y3 4
Y1 5
Inhibit 6
VEE 7
VSS 8
16 VDD
15 X2
14 X1
13 X
12 X0
11 X3
10 A
9 B

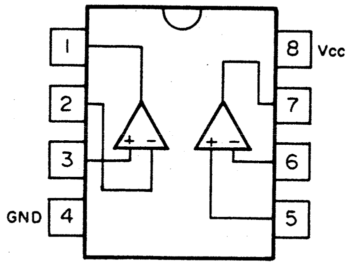
HD14052BFP
MC14052BCP


In 1 1
Out 1 2
Out 2 3
In 2 4
Control 2 5
Control 3 6
Vss 7
14 VDD
13 Control 1
12 Control 4
11 In 4
10 Out 4
9 Out 3
8 In 3

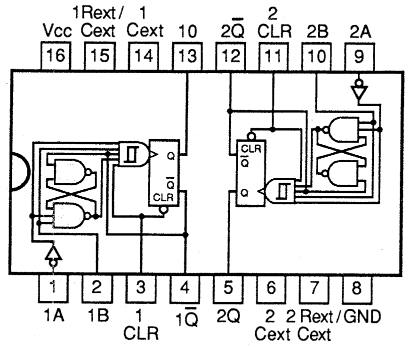
HD14066BFP


1A 1
1B 2
1CLR 3
1Q̄ 4
2Q 5
2Cext 6
2Rext/Cext 7
GND 8
16 Vcc
15 1Rext/Cext
14 1Cext
13 1Q
12 2Q̄
11 2CLR
10 2B
9 2A

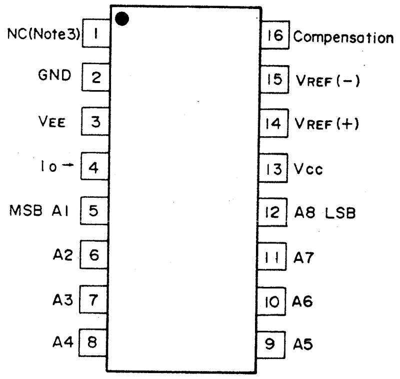
HD74HC123FP


1
2
3
GND 4
8 Vcc
7
6
5

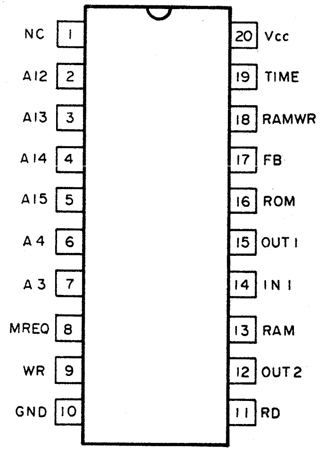
NJM4558D


Vcc 16
1Rext/Cext 15
1Cext 14
1Q 13
2Q̄ 12
2CLR 11
2B 10
2A 9
1A 1
1B 2
1CLR 3
1Q̄ 4
2Q 5
2Rext/Cext 6
2Cext 7
GND 8

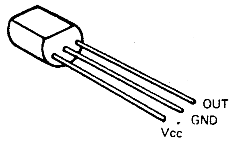
HD74HC221FP


NC(Note3) 1
GND 2
VEE 3
Io 4
MSB A1 5
A2 6
A3 7
A4 8
16 Compensation
15 VREF(−)
14 VREF(+)
13 Vcc
12 A8 LSB
11 A7
10 A6
9 A5

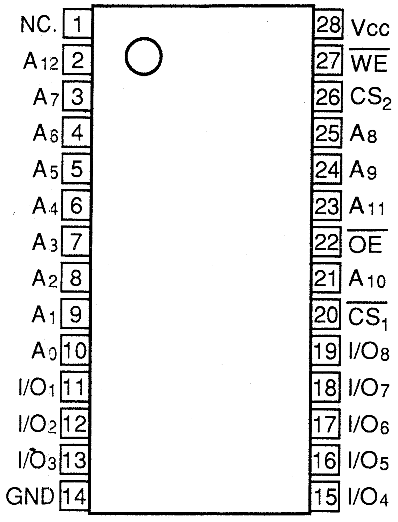
DAC0808LCN


NC 1
A12 2
A13 3
A14 4
A15 5
A4 6
A3 7
MREQ 8
WR 9
GND 10
20 Vcc
19 TIME
18 RAMWR
17 FB
16 ROM
15 OUT1
14 IN1
13 RAM
12 OUT2
11 RD

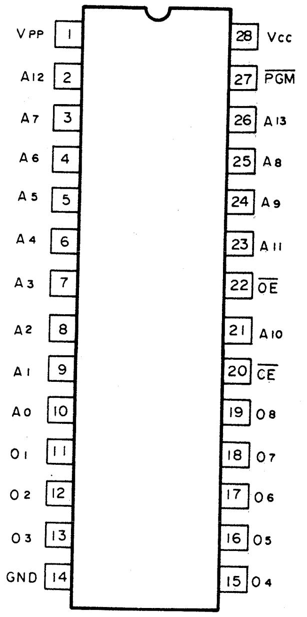
DTM-5010



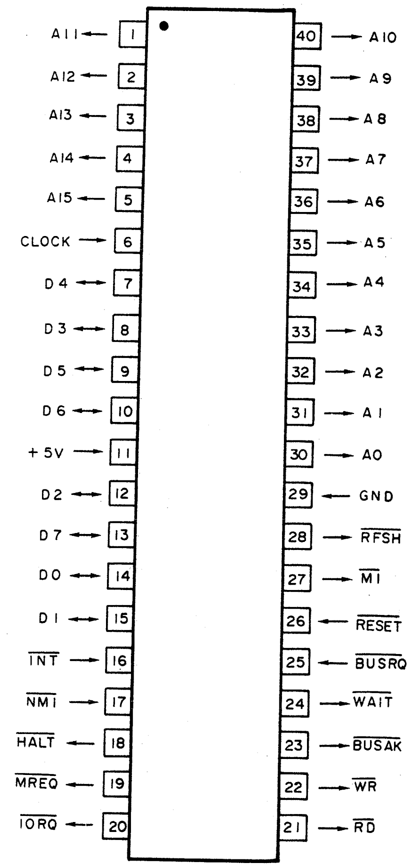
PST518B


NC. 1
A12 2
A7 3
A6 4
A5 5
A4 6
A3 7
A2 8
A1 9
A0 10
I/O1 11
I/O2 12
I/O3 13
GND 14
28 Vcc
27 W̄Ē
26 CS2
25 A8
24 A9
23 A11
22 ŌĒ
21 A10
20 C̄S̄1
19 I/O8
18 I/O7
17 I/O6
16 I/O5
15 I/O4

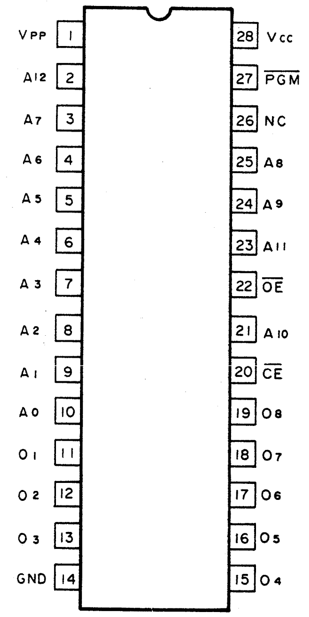
MB8464A-15LL


VPP 1
A12 2
A7 3
A6 4
A5 5
A4 6
A3 7
A2 8
A1 9
A0 10
O1 11
O2 12
O3 13
GND 14
28 Vcc
27 P̄ḠM̄
26 A13
25 A8
24 A9
23 A11
22 ŌĒ
21 A10
20 C̄Ē
19 O8
18 O7
17 O6
16 O5
15 O4

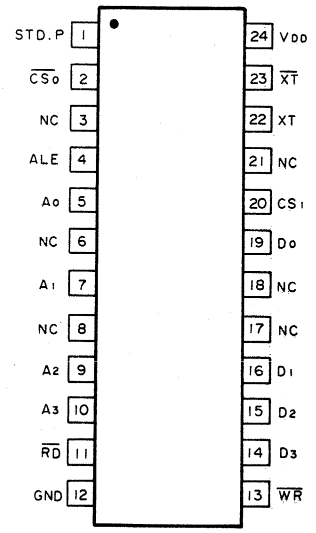
MBM27C256∗T


A11 1
A12 2
A13 3
A14 4
A15 5
CLOCK 6
D4 7
D3 8
D5 9
D6 10
+5V 11
D2 12
D7 13
D0 14
D1 15
ĪN̄T̄ 16
N̄M̄Ī 17
H̄ĀL̄T̄ 18
M̄R̄ĒQ̄ 19
ĪŌR̄Q̄ 20
40 A10
39 A9
38 A8
37 A7
36 A6
35 A5
34 A4
33 A3
32 A2
31 A1
30 A0
29 GND
28 R̄F̄S̄H̄
27 M̄1̄
26 R̄ĒS̄ĒT̄
25 B̄ŪS̄R̄Q̄
24 W̄ĀĪT̄
23 B̄ŪS̄ĀK̄
22 W̄R̄
21 R̄D̄

LH0080A


VPP 1
A12 2
A7 3
A6 4
A5 5
A4 6
A3 7
A2 8
A1 9
A0 10
O1 11
O2 12
O3 13
GND 14
28 Vcc
27 P̄ḠM̄
26 NC
25 A8
24 A9
23 A11
22 ŌĒ
21 A10
20 C̄Ē
19 O8
18 O7
17 O6
16 O5
15 O4

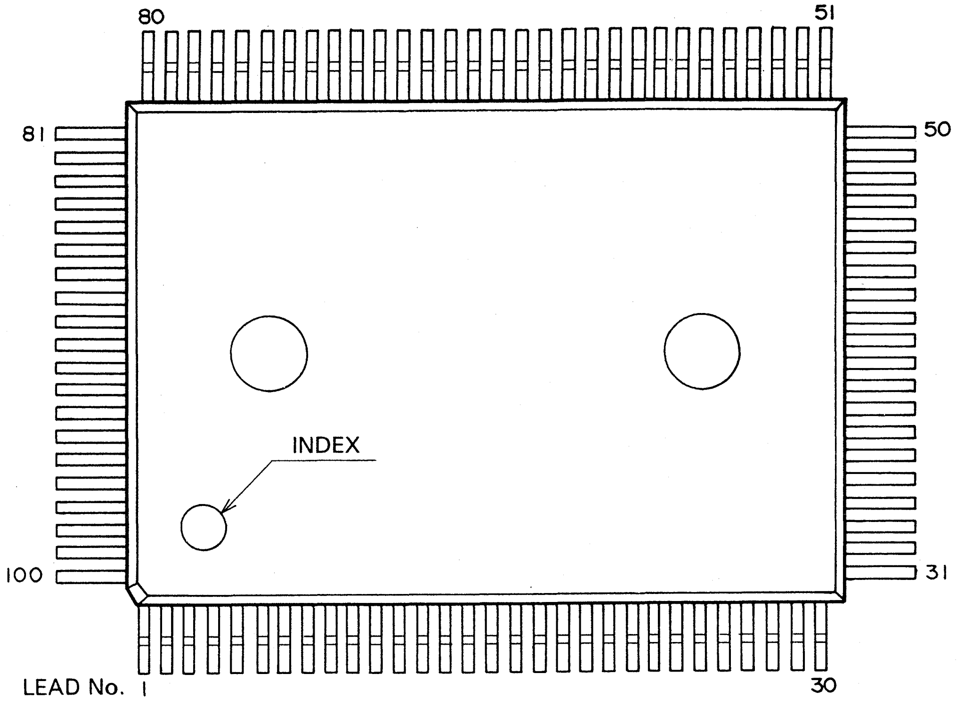
MBM27C64∗V


STD.P 1
C̄S̄0 2
NC 3
ALE 4
A0 5
NC 6
A1 7
NC 8
A2 9
A3 10
R̄D̄ 11
GND 12
24 VDD
23 X̄T̄
22 XT
21 NC
20 CS1
19 D0
18 NC
17 NC
16 D1
15 D2
14 D3
13 W̄R̄

MSM6242BGS-VK

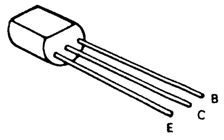
SEMICONDUCTORS

CTM5020

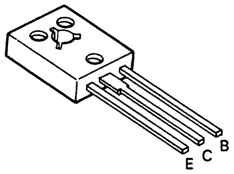


Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name
1	CONT	26	TSD0	51	GETD	76	DD3
2	A13	27	TSD1	52	CA0	77	SING
3	VDD	28	VDD	53	VDD	78	VDD
4	A14	29	TSD2	54	CA4	79	R10M
5	A15	30	AX2	55	CA3	80	10M
6	INT0	31	AX1	56	CA2	81	HLDF
7	VX3	32	AX0	57	CA1	82	SGA
8	VX2	33	AX3	58	CD3	83	ROSP
9	VX1	34	HS2	59	CD2	84	ROD
10	VX0	35	HS1	60	CD4	85	HLDL
11	DA0	36	TDIO	61	CD1	86	ROUB
12	DA1	37	TWE	62	CD5	87	ROB
13	DA2	38	TCK1	63	DC4	88	ROQ
14	DA3	39	TST1	64	CD7	89	ROED
15	VSS	40	VSS	65	VSS	90	VSS
16	DA4	41	TST2	66	DC3	91	D7
17	DA5	42	TADD	67	DC2	92	D5
18	DA6	43	TCK2	68	CD6	93	D3
19	DA7	44	VS2	69	DC1	94	D1
20	DA8	45	VS1	70	DC0	95	ALE
21	DA9	46	VA0	71	CD0	96	D6
22	ROR	47	VA4	72	DD7	97	D4
23	ROA	48	VA3	73	DD6	98	D2
24	LEVX	49	VA2	74	DD5	99	D0
25	TCL	50	VA1	75	DD4	100	WR

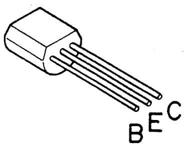
SEMICONDUCTORS



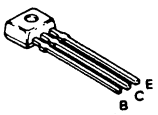
2SA684 (Q)
2SA1208 (S, T)
2SC2271 (D)
2SC2910 (S, T)
2SC1384 (R, S)
2SC1384 (Q)
2SA1005 (K)



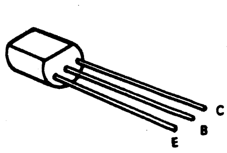
2SA1209 (S, T)
2SA1406 (E, F)
2SC2911 (S, T)
2SC3600 (E, F)



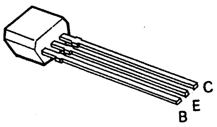
2SA1161
2SC3779 (D)



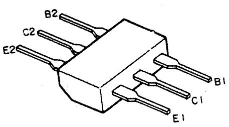
2SA1175 (F)
2SC2785 (F)
2SC3732 (L)
2SA1174 (E, F)



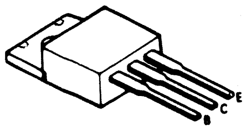
2SA1206



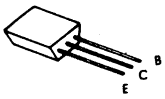
2SA1565
2SC4049


B2
C2
E2
B1
C1
E1

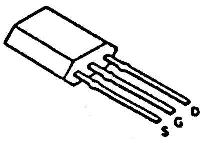
2SC4072
2SC3066 (F)



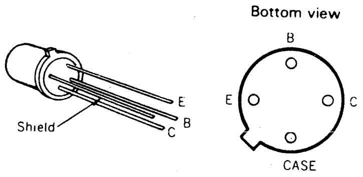
2SB1133 (S)
2SD1666 (S)



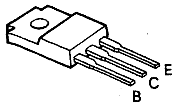
2SC3315 (C)
2SC3354 (T, S)



2SK304 (F)

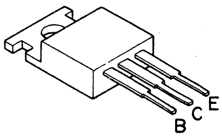

Bottom view
Shield
E
B
C
B
E
C
CASE

2SC1164 (O)*S

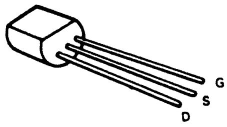


2SD1409

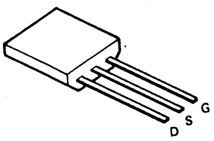
SEMICONDUCTORS



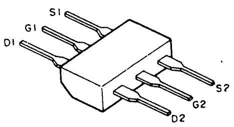
2SD613 (E)



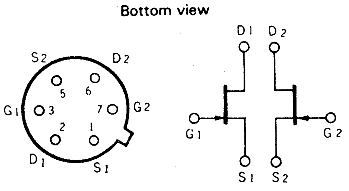
2SK583



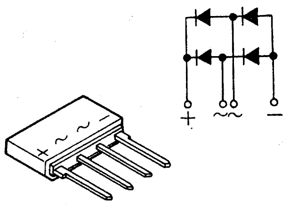
2SK241 (GR)


S1
G1
D1
S2
G2
D2

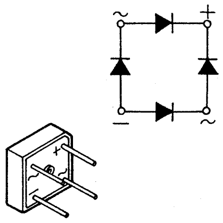
2SK332 (E)


Bottom view
S2
D2
5
6
G1
3
7
G2
2
1
D1
S1
D1
D2
G1
G2
S1
S2

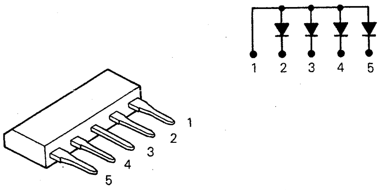
DN1901



S1VB60



S4VB40F


1
2
3
4
5
1
2
3
4
5

DAP401

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